USDA REPORT

WESTERN NEW YORK RIVER BASINS

OSWEGO RIVER BASIN

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE REPORT FOR THE OSWEGO RIVER BASIN

Western New York

Type IV

River Basins Study

Prepared for

Cayuga Lake, Chemung River, Eastern Oswego, and

Wa-Onta Ya Basin Regional Water Resources Planning Boards

Prepared by:

United States Department of Agriculture

U.S. Soil Conservation Service Economic Research Service Forest Service

June 1972

PREFACE

This report represents the United States Department of Agriculture's input to the plan formulation which is coordinated by the Division of Water Resources, New York State Department of Environmental Conservation. A comprehensive plan for the water and related land resources of the Oswego River Basin will evolve from these efforts.

This report identifies water and related land resource problems and needs and recommends means for solving the problems and meeting needs. The Economic Research Service, Forest Service, and Soil Conservation Service represent the United States Department of Agriculture in this study. Other federal, state, and local interests are providing reports on other needs and recommendations which will contribute to the formulation of a comprehensive water and related land resource plan for the Basin. The four regional water resources planning boards have the responsibility for developing this plan.

CONTENTS

ILLUSTRATIONS

TABLES

PHOTOGRAPHS

CHAPTER I

SUMMARY

The United States Department of Agriculture is assisting in the preparation of a comprehensive and coordinated plan for the management and development of the water and related land resources of the Oswego River Basin under the authority of Section 6, Public Law 566, 83rd Congress, as amended. This study was made in cooperation with the Cayuga Lake, Chemung River, Eastern Oswego, and Wa-Ont-Ya Regional Water Resources Planning Boards. These boards are legal entities of New York State, authorized to obtain assistance from various federal, state, and local agencies. Federal participation, in addition to the United States Department of Agriculture, include the Corps of Engineers, and the Department of Interior. New York State agencies participating were the Departments of Agriculture and Markets, Commerce, Environmental Conservation, Health, Law, and Transportation.

OBJECTIVES AND SCOPE

To meet the primary objective of facilitating the coordination and orderly conservation, development, utilization, and management of water and related land resources, an inventory of resources was made. This included identifying agriculture and rural water needs, upstream floodwater damages, upstream sediment and erosion problems, potential for developing upstream reservoir sites, areas requiring improved land management and accelerated land treatment needs, and those upstream watershed projects which could be installed in the next 10 to 15 years. The potential for providing drainage and irrigation was defined along with the economic development for agriculture.

DESCRIPTION

The Oswego River Basin is located in central New York State. Parts of 17 counties are in the Basin with Seneca County being entirely within the Basin. There are over three million acres of land in the Basin which represents over 4,800 square miles or approximately 10 percent of the total state area and produces about 20 percent of the agricultural products.

PROBLEMS AND NEEDS

FLOOD WATER AND SEDIMENT DAMAGES

The Basin experiences average annual damage exceeding $989,600 from the flooding of urban and agricultural lands. Higinbotham Brook in Oneida County causes the main concentration of urban damage and amounts to $16,000. Damage to lakeshore properties amounts to $139,200 annually. Agricultural flooding affects an estimated 45,000 acres of land, including 29,000 acres along the New York State Barge Canal.

While erosion is not generally severe, there are local areas with serious problems. Measures are needed to control these areas to reduce the amount of sediment reaching the streams and lakes.

AGRICULTURAL WATER MANAGEMENT

Of the 1.1 million acres potentially usable for irrigation, only about 9,600 are being irrigated at this time. It is estimated that over 260,000 acres could be irrigated economically. There are 280,000 acres of cropland and pasture which have drainage problems in the Basin.

WATERSHED PROTECTION AND MANAGEMENT

Land treatment measures are needed to reduce soil erosion, damage from excess water, improve productivity, and improve unfavorable soil conditions. Conservation treatment will be needed on 683,730 acres of cropland, 141,560 acres of pastureland and 797,000 acres of forest land.

Much of the privately-owned non-industrial forested area is contributing less than its full potential to the economic growth and welfare. Ten percent of the forest land is in poor to very poor hydrologic condtion; however, the potential to improve is generally high. Multiple use management and protection is needed to realize these potentials. Timber quality is low, land values and related taxes are increasing and many forest landowners are more interested in the recreational and aesthetic uses of their lands rather than timber production. Multiple use management and land treatment measures are needed on nearly 800,000 acres of small private, non-industrial forest land. This figure contains a duplication of acres since some acres of forest land may require more than one treatment to meet identified needs. A greater environmental education effort and additional incentive programs to the landowners are needed if the forest resources are to be fully developed and utilized. Several small municipal watersheds are not under management and technical assistance is needed in the fields of hydrology and watershed management.

Urbanization is occurring rapidly in the major areas of population concentration, particularly in Syracue, Auburn, Ithaca, and Rome, and also in the resort areas of Canandaigua, Geneva, and Watkins Glen. The expanding population in these areas will require much reconstruction in the city areas, greatly expanded suburban developments, and large numbers of rural homes in the outlying areas. The construction of facilities for servicing this population in the form of shopping centers, highways, and park areas will involve large amounts of land. Adequate planning, including the use of soil surveys, is necessary to: achieve proper land use; reduce flood damages by zoning flood-prone areas to appropriate use such as parks, open space, and agriculture; control erosion and resulting sediment problems to the maximum extent during construction activities; develop and maintain adequate vegetative cover and waterways to minimize damage from runoff and erosion.

The need for protecting existing water surface areas and the development of new water bodies, the preservation of open space, plus the need for improved and increased wildlife habitat are also essential to maintain a quality environment.

The environmental quality provided by trees and other vegetation, in many urban areas and communities is deteriorating. The environmental importance of vegetation is often inadequately considered in the development of new communities. Community action, planning, and management of all vegetation is needed for improvement of aesthetics and microclimate control.

WATER QUALITY

Water quality problems exist in many areas. Sediment, sewage, industrial waste, and animal waste are the main causes of pollution. The main areas of concern are: Syracuse-Onondaga Lake Area, Finger Lakes Outlets, Seneca River, Seneca Falls-Waterloo Area, Barge Canal below Newark, and the Oswego River below Fulton. Flow augmentation is a possible alternative to improve both water quality and fishing.

WATER SUPPLY

Ithaca is the only large municipality with a water supply shortage at the present time; however, 29 rural villages are expected to have shortages totaling 312 mgd by 2020.

RECREATION, FISH AND WILDLIFE

Lack of access to many public waters is a major recreational problem. Also, more than 70,000 acres of developed recreational areas will be needed by 2020. Preservation of wetlands for wildlife is also needed.

FINDINGS AND CONCLUSIONS

An inventory of potential upstream water impoundment sites resulted in the identification of 193 sites supplying over 682,200 acre-feet of beneficial storage and over 43,500 acres of pool area. Structures at these sites, along with the needed land treatment behind the structures have the potential to meet needs for flood prevention, irrigation, recreation, low flow augmentation, municipal and industrial water supply and fish and wildlife.

Existing surface water resources can further be developed by acquiring and constructing public access facilities to more fully utilize their potential for recreational areas.

Approximately 24 miles of channel improvement could provide flood control and drainage improvement for over 4,700 acres of agricultural land in five project areas. Additional improvements can be made through small group projects.

Irrigation systems, using water from the Barge Canal, can be developed to irrigate more than 9,000 acres of agricultural land along the canal. Individual systems from reservoirs can also be developed.

SOLUTIONS THROUGH U S D A PROGRAMS

Public Law 566

One watershed is currently being planned and seven additional potential projects have been identified in the Basin. Accelerated land treatment is expected to be carried out on most of the land in these project areas. Total installation costs of the structural measures is estimated to be $9,332,600 and the total annual benefits are estimated to be $1,068,850.

The Flint Creek Watershed is in the planning phase of the Public Law 566 program. The primary watershed problem is the frequent flooding of highly developed muckland used in the commercial production of vegetables. A secondary but major objective is to develop a dependable supply of water for irrigation.

The major structural measures in the Flint Creek Watershed include one floodwater retarding structure, one multipurpose floodwater retarding and irrigation structures,and 22.3 miles of channel improvement. The average annual cost of the project is $300,300 and the average annual benefits which will accrue are $532,400.

The seven potential projects identified in the Basin are summarized in Table 1.1.

RESOURCE CONSERVATION AND DEVELOPMENT PROGRAMS

Madison and Cortland Counties are included in the South Central New York Resource Conservation and Development Project (RC&D). Technical assistance and the installation of needed land treatment in these counties can be performed in conjunction with the RC&D projects.

TABLE 1.1 - COST AND BENEFIT DATA FOR STRUCTURAL DEVELOPMENTS IN POTENTIAL PROJECTS, OSWEGO RIVER BASIN, NEW YORK

WS No.	Project Area	No. Sites	Miles of Channel	Installation Cost 1/	Average Annual Cost	Average Annual Benefits	Benefit Cost Ratio	Area Benefited (Acres) Flood	Irrig.	Drainage	Purpose
12	Higinbotham Brook	1		153,000	8,770 2/	17,270	2.0:1.0				FC
88	Mud Creek	Pump Plant		239,200	19,310 4/	21,210	1.1:1.0	140			FC
127	Rome Muck		6.1	602,200	41,980 3/	90,890	2.2:1.0	685	620	685	FC, Irrig.,Dr.
426	Six Mile Creek	1	4.1	1,723,000	131,250 3/	264,550	2.0:1.0	425	425		FC, Irrig.,Rec.
433	Black Creek		1.7	273,200	22,820 4/	26,600	1.2:1.0	400			FC
433	Wine Creek		5.2	285,700	22,540 4/	26,200	1.2:1.0	385			FC
454	Sodus Ditch		6.7	1,107,000	77,880 3/	89,730	1.2:1.0	3,000	4,000	3,000	FC, Irrig., Dr.
TOTAL POTENTIAL PROJECTS		2	23.1	4,383,300	324,550	536,450	1.7:1.0	5,035	5,045	3,685	

1/ Price Base: 1969 except for Mud Creek which has a price base of 1971
2/ Amortization over 100 years at 5-3/8 percent interest
3/ Amortization over 50 years at 5-3/8 percent interest
4/ Amortization over 25 years at 5-3/8 percent interest

A reservoir site, No. 122-3 can be developed under this program to supply recreational opportunities for the people of Syracuse metropolitan area. The total cost is estimated at $1.8 million. Annual cost is $98,800 and annual benefits $391,500, giving a favorable B:C ratio of 4.0:1.0

LAND TREATMENT PROGRAMS

Land treatment measures are continually being installed through such programs as Public Laws 46 and 566, Cooperative Forest Management (CFM), and Resource Conservation and Development (RC&D). By 1980 there will be 178,930 acres of cropland, 43,350 acres of pasture, and 115,500 acres of forest to be treated. The estimated cost of the needed land treatment is $25,250,100.

IMPACTS

Present trends indicate that there will be continuing rapid urban and industrial expansion in the Basin. Land areas devoted to agriculture will decline while recreational development will expand rapidly. Forest land will remain relatively constant in acreage.

Hydrologic conditions in the Basin should improve with the improved management of cropland and forest lands. This improvement of the hydrologic conditions will maintain or improve the water quality in the Basin.

Installation of 14 project developments would provide an estimated $928,000 in annual net benefits. This results in an annual regional effect of almost 2 million dollars. In addition to the annual figures, there will be $16.7 million in installation expenditures during the period of project construction.

POLICY CONSTRAINTS

At the present time, projects applicable to Public Law 566 are those potential developments which have flood control or irrigation as the primary purpose. However, present policy constraints limit the program to projects having flood control as the primary purpose. This constraint severely limits the concept of total resource development of an area. In the Oswego River Basin four potential irrigation project areas, with more than 21,100 acres of irrigable land, cannot be developed with this constraint.

NEEDED AUTHORITY

Expansion of existing cooperative programs to allow for the provision of technical assistance in urban and community forestry is needed.

A program is needed to provide communities and watershed managers with planning and consultive services related to the protection, restoration and productivity of municipal watersheds.

The Rural Environmental Assistance Program (REAP) which has been effective in promoting good agricultural and forestry practices needs to be expanded. With more REAP funds available and the possible 100 percent federal financing of critical area work, a larger amount of needed conservation work could be accomplished by this program.

CHAPTER II

INTRODUCTION

Projections of increases in population, industrial output, and agricultural water use point to increased pressures on our land and water resources and possible conflicts among users competing for limited supplies. To minimize those conflicts, it is highly desirable that a cooperative and coordinated effort be made to identify potential problem areas and evaluate means of resolving them.

The United States Department of Agriculture is assisting in the preparation of a comprehensive and coordinated plan for the development of the water and related land resources of the Oswego River Basin under the authority of Section 6, Public Law 566, 83rd Congress, as amended. This study was made in cooperation with the Wa-Ont-Ya, Cayuga Lake, Chemung River, and Eastern Oswego Regional Water Resources Planning Boards.

These Boards are legal entities of New York State and are authorized to obtain assistance from various federal, state, and local agencies. Federal participation, in addition to the United States Department of Agriculture, included the Corps of Engineers, United States Army, the Departments of Interior and Commerce, and the Federal Power Commission. New York State agencies participating were the Departments of Agriculture and Markets, Commerce, Environmental Conservation, Health, Law, Transportation, Office of Planning Coordination, and Office of Parks and Outdoor Recreation.

OBJECTIVES

The primary objective of the United States Department of Agriculture's participation in the Oswego River Basin is to facilitate the coordination and orderly conservation, development, utilization, and management of water and related land resources. Toward this end the departmental agencies made an inventory of the water and related land resources to the extent that it did:

1. Identify agriculture and rural water needs.

2. Identify upstream floodwater damages by major watershed areas.

3. Identify upstream sediment and erosion problems.

4. Determine the potential for developing upstream reservoir sites.

5. Identify areas requiring improved land management and accelerated land treatment needs in rural areas.

6. Define the potential for providing drainage to those areas which are presently excluded from an intensified agricultural program due to drainage problems.

7. Define those areas which are capable of being irrigated in terms of acres and quantities of supplemental water needs.

8. Define the economic development potential for agriculture and forestry.

9. Determine the opportunities for meeting basin-wide needs for water and related goods and services through potential water and related land resource developments in the upstream area.

10. Identify those upstream watershed projects which could be installed in the next 10 to 15 years.

11. Consider those nonagricultural water needs as defined by other agencies which can be met through upstream watershed development.

The results of these studies will be used by the Regional Water Resources Planning Boards in the formulation of short and long-range water and related land resource programs for the Basin.

LOCATION

The Oswego River Basin is located in central New York State as shown in Figure 2.1. Parts of 17 counties are in the Basin with only one, Seneca County, entirely within the Basin. Specific acreage breakdown by counties is given in Table 2.1. There are over three million acres of land in the Basin which represents over 4,800 square miles. This is approximately 10 percent of the total state area.

DESCRIPTION OF THE BASIN

The Basin lies in three physiographic regions. A major portion is in the moderately sloping Allegheny Plateau's region which contains mostly a dairy farming type agriculture, although the southwestern part of the Basin is known for its grape production. Flatter topography is found to the north in the Ontario-Mohawk Lake Plain region. Here the soils are more suited to irrigation and higher value crops. Cash crops and vegetables predominate.

In the Tug Hill Plateau region to the northeast, forests are the predominant land use with some dairy farms scattered throughout. The topography is more rugged and less suitable land is available for tilling. Large areas are held for recreational purposes.

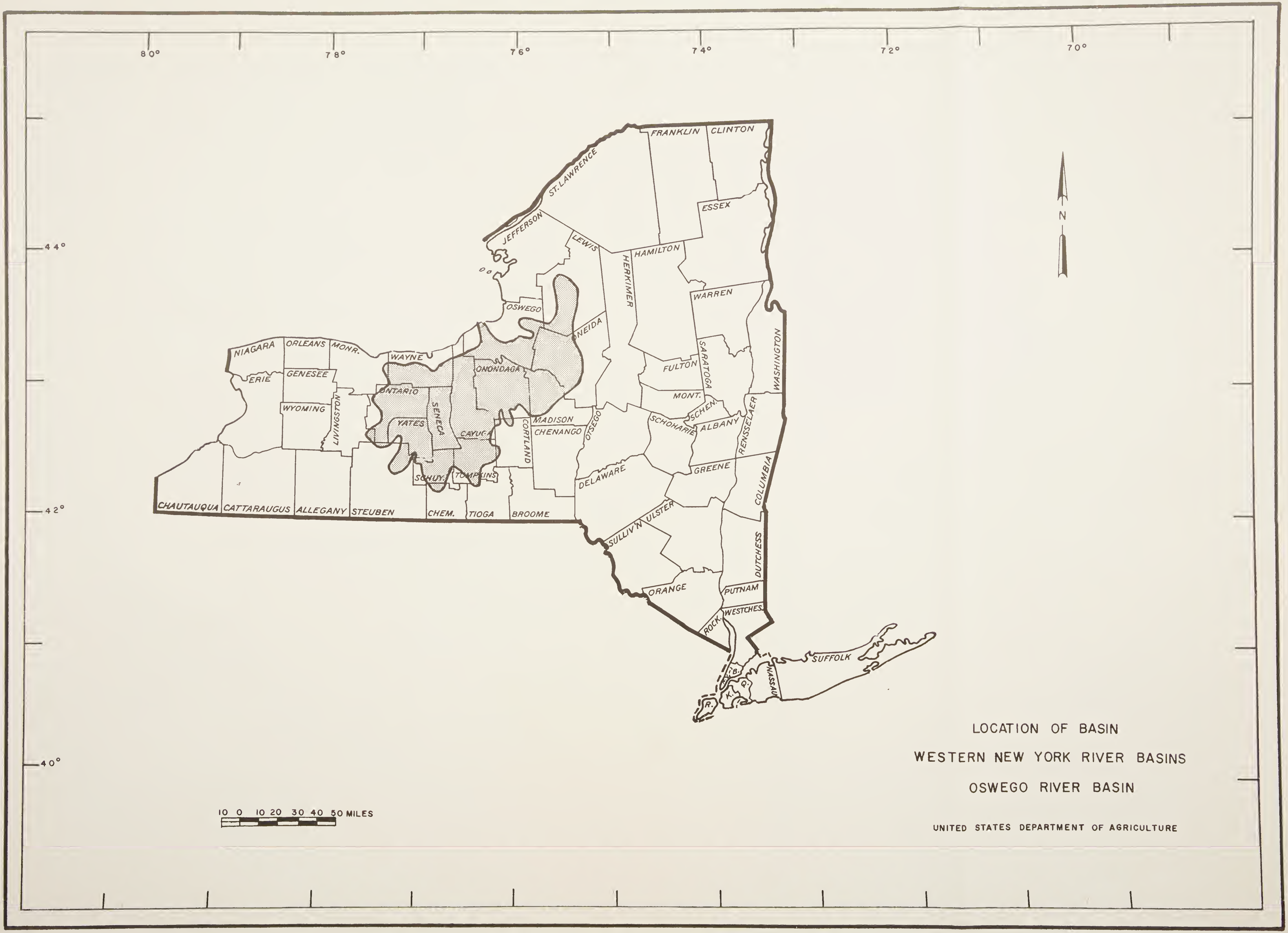
Vegetation in the Oswego River Basin prior to colonial settlement consisted primarily of mature northern hardwood forests. Clearing for agricultural purposes eliminated a large percentage of the forest cover. Present land use estimates indicate that about 37 percent of the total Basin is forested. Forest lands are generally intermingled with farms.

Heavily forested areas exist mostly in the northeastern part of the Basin, although the southern portion, particularly along the ridges surrounding the Finger Lakes, also contains relatively large areas of forest land.

Land use, as shown in Figure 2.2, is predominantly cropland and forest land. These two uses are nearly equally divided and comprise three quarters of the land use. The remaining 25 percent is divided between pasture, urban, and other. Much of the non-urban land not in active agriculture is held by people primarily interested in its recreational value.

Syracuse is the major industrial and business center in the Basin and is the state's fourth largest city. Rochester, the state's third largest city, is just west of the Basin.

The Basin holds a strategic position in the state's agriculture, producing close to 20 percent of the state's agricultural commodities. Included in the Basin is the well-known Finger Lakes area, popular for its scenic beauty and outdoor recreation aspects.



LOCATION OF BASIN

WESTERN NEW YORK RIVER BASINS

OSWEGO RIVER BASIN

UNITED STATES DEPARTMENT OF AGRICULTURE

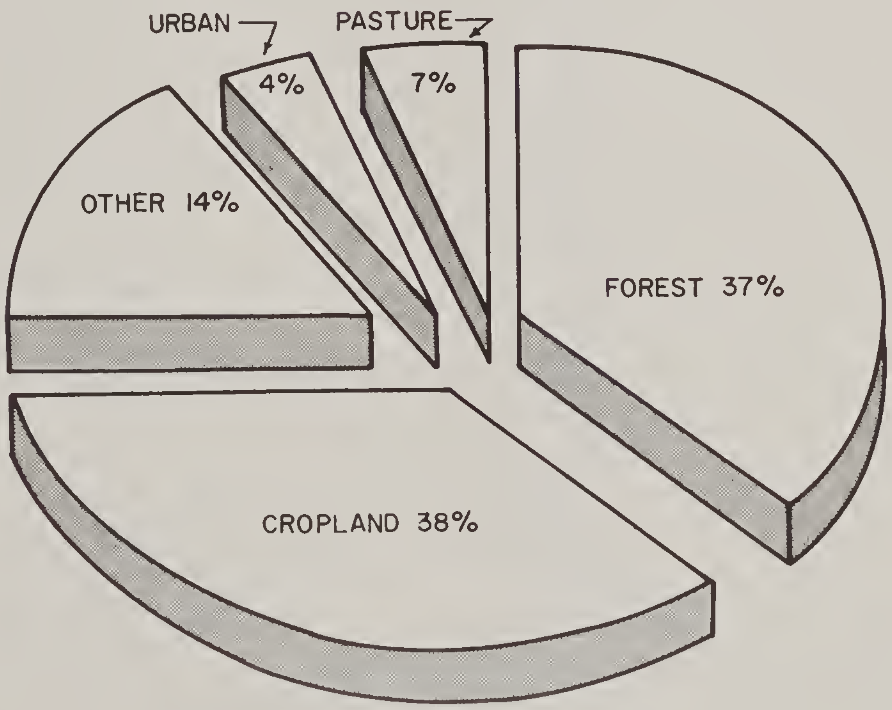
FIGURE 2·1

TABLE 2.1 - ACREAGE AND PERCENT OF BASIN TOTAL FOR COUNTIES IN THE OSWEGO RIVER BASIN, NEW YORK

County	Acreage in Basin (Acres)	Percent of Basin Total (Percent)
Cayuga	373,600	12.1
Chemung	28,200	0.9
Cortland	44,200	1.4
Lewis	67,000	2.2
Livingston	300	1/
Madison	183,000	5.9
Monroe	2,000	1/
Oneida	231,600	7.5
Onondaga	469,300	15.2
Ontario	333,800	10.8
Oswego	293,500	9.5
Schuyler	131,000	4.2
Seneca	211,200	6.9
Steuben	46,500	1.5
Tioga	1,000	1/
Tompkins	268,300	8.7
Wayne	189,700	6.2
Yates	208,300	6.8
TOTAL	3,082,500	100

1/ Less than 0.1 percent

FIGURE 2.2 - PRESENT LAND USE IN THE OSWEGO RIVER BASIN, NEW YORK



PROCEDURES

The natural subdivision of any river basin is by hydrologic watershed boundaries. It was agreed to use the New York State Soil and Water Conservation Needs Inventory delineations of watersheds for the study of the Oswego River Basin. Location of these watersheds are shown on Figure 2.3 and the watershed numbers, names, and drainage areas are listed in Table 2.2.

The study was conducted in two phases. In the first phase, floodwater problems of both an agricultural and nonagricultural nature were inventoried for each major stream and its tributaries. Sediment and erosion problems were investigated. Forest land was examined for problems related to hydrologic condition and forest resources. Major problems which possibly could be solved under USDA programs were delineated for further study.

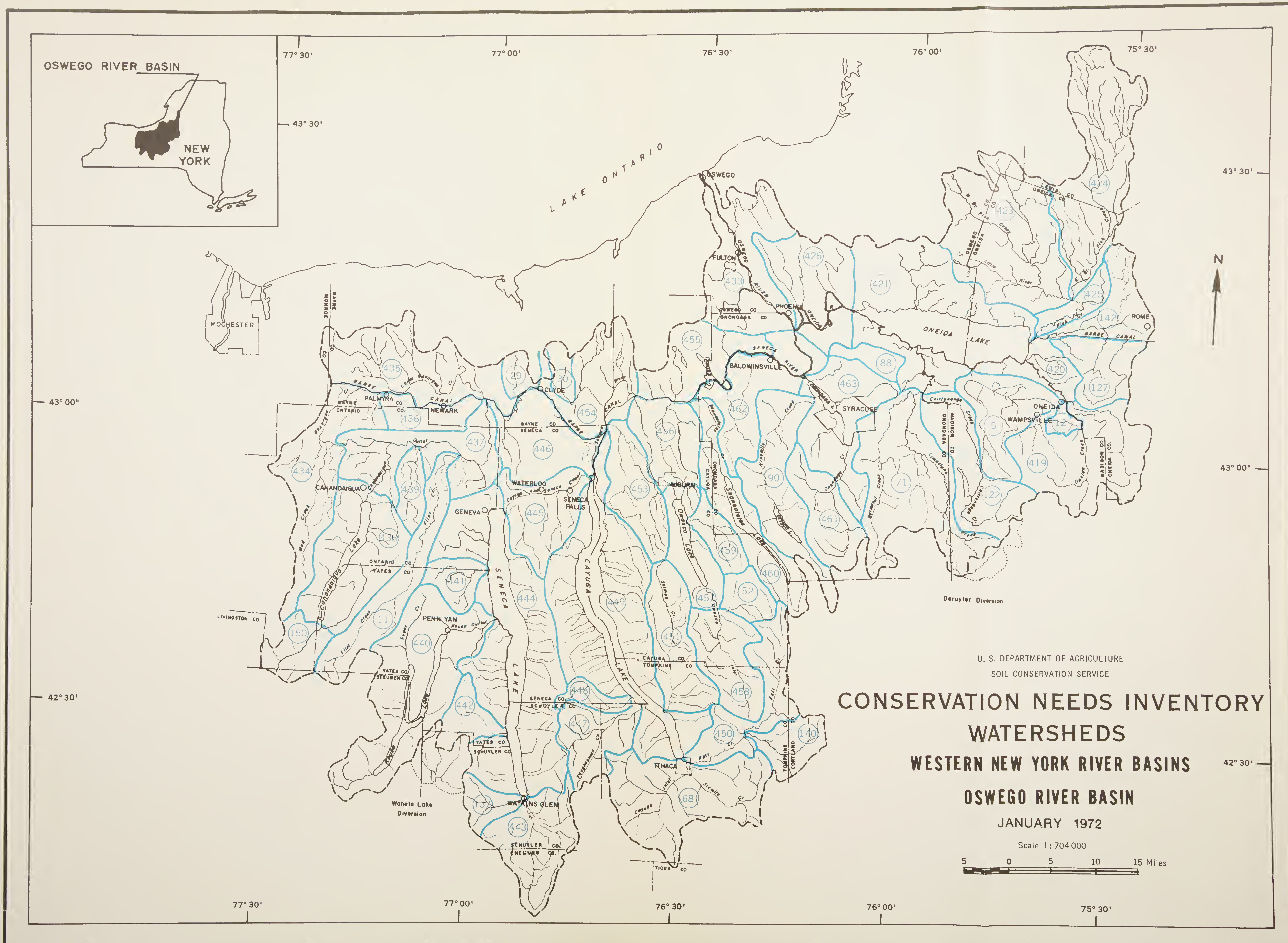
The second phase of the study was to examine the problems in greater detail and attempt to find solutions for these problems. An inventory of potential sites for upstream water impoundments was made. These sites were evaluated as to cost vs. potential use. Areas of soils suited for irrigation were delineated and acreages were computed. Parts of the Basin needing agricultural drainage were determined and evaluated. Forest management practices and trends were studied. Rural water supply needed for both domestic and livestock use were tabulated. Other problems which were studied by the Department of Environmental Conservation, rather than the USDA, were also considered.

Inventory, data, and analyses developed in this study provide an opportunity for identifying future Public Law 566 small watershed projects. In view of this, possible solutions under USDA programs were examined. Where USDA programs were not applicable, possible solution through other means were offered for consideration during the formulation of the comprehensive plan by the various regional water resource planning boards.

TABLE 2.2 - LOCATION AND DRAINAGE AREAS OF CNI[1/] WATERSHEDS IN THE OSWEGO RIVER BASIN, NEW YORK

Watershed Number	Name	Principal County	Drainage Area Sq. Mi.
5	Canastota Creek	Madison	117.0
11	Flint Creek	Yates	98.2
12	Higinbotham Brook	Madison	1.56
29	Black Brook	Wayne	17.0
30	Black Creek	Wayne	19.6
52	Mill Creek	Cayuga	28.8
68	Inlet Creek	Tompkins	154.0
71	Limestone Creek	Onondaga	169
88	Mud Creek	Onondaga	31.1
90	Ninemile Creek	Onondaga	96.3
122	Chittenango Creek	Madison	109
127	Woods Creek	Oneida	56.1
137	Glen Creek	Schuyler	26.6
140	Virgil Creek	Tompkins	41.9
142	Wood Creek	Oneida	55.3
150	Naples Creek	Ontario	49.4
419	Upper Oneida Creek	Madison	119
420	Lower Oneida Creek	Oneida	32.7
421	North Oneida Lake	Oswego	133
422	South Oneida Lake	Onondaga	39.6
423	W. Branch Fish Creek	Oneida	200
424	E. Branch Fish Creek	Lewis	180
425	Lower Fish Creek	Oneida	24.0
426	Oneida River	Oswego	107
433	Lower Oswego River	Oswego	141
434	Mud Creek	Ontario	131
435	Ganargua Creek	Wayne	150
436	Barge Canal at Newark	Wayne	46.6
437	Canandaigua Outlet	Ontario	120
438	Canandaigua Lake	Ontario	137
439	Rocky Run	Ontario	26.3
440	Keuka Lake	Yates	206
441	Kashong Creek	Yates	28.6
442	Big Stream	Yates	38.2
443	Catherine Creek	Schuyler	95.0
444	Seneca Lake	Seneca	318
445	Cayuga and Seneca Canal	Seneca	78.2
446	Clyde River	Seneca	95.4
447	Taughannock Creek	Tompkins	68.4
448	Trumansburg Creek	Seneca	17.5
449	Cayuga Lake	Seneca	303
450	Fall Creek	Tompkins	82.0
451	Salmon Creek	Tompkins	92.9
452	Yawger Creek	Cayuga	26.8
453	Crane Brook	Cayuga	50.6
454	Upper Seneca River	Wayne	102
455	Cross Lake and Barge Canal	Cayuga	88.4
456	Owasco Outlet	Cayuga	70.3
457	Owasco Lake	Cayuga	54.7
458	Owasco Inlet	Cayuga	84.5
459	Dutch Hollow Brook	Cayuga	36.9
460	Skaneateles Lake	Onondaga	95.5
461	W. Branch Onondaga Creek	Onondaga	89.4
462	Lower Seneca River	Onondaga	115
463	Onondaga Lake	Onondaga	113

1/ Conservation Needs Inventory



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 2.3

CHAPTER III

NATURAL RESOURCES OF THE BASIN

Agriculture and forestry are the primary industries in the Oswego River Basin. This is due in part to the availability of natural resources which are favorable for agricultural production. These resources include climate, topography, soils, and water. The information which follows shows how these natural resources benefit the agricultural economy of the area.

CLIMATE

Climate in the Basin is humid continental. Weather elements vary considerably and all but the southern section is influenced by the Great Lakes. The most striking difference is in the Tug Hill area because of its higher elevations and location relative to Lake Ontario. It has greater total precipitation and cooler temperatures.

Average annual precipitation is 32-36 inches in the western part of the Basin, 36-40 inches in the central section, and 40-52 inches in the Tug Hill area in the northeast. Figure 3.1 shows the distribution over the Basin.

Distribution of the rainfall throughout the year is fairly uniform with 15 to 18 inches occuring during the growing season in most areas. Precipitation in the Tug Hill area is slightly higher (18-21 inches) and the Oswego area slightly lower (less than 15 inches) than the norm. The difference between 15 inches and 18 inches of growing season precipitation is significant to the agriculture of the Basin. The frequency of drought is much higher in the lower rainfall areas. More details on the climate can be found in Appendix C - *Irrigation Report.*

Mean annual temperatures in the Basin range from 43° in the Tug Hill region to 48° throughout the rest of the area. Extreme temperatures recorded at official weather stations show a maximum of 105° and a minimum of less than -31°. The expected maximum monthly mean temperature is between 67° and 72° and occurs in July; the minimum monthly mean temperatures range from 18° to 26° and occurs in January. The growing season ranges from 130 to 180 days with an average of 160 days over 85 percent of the Basin.

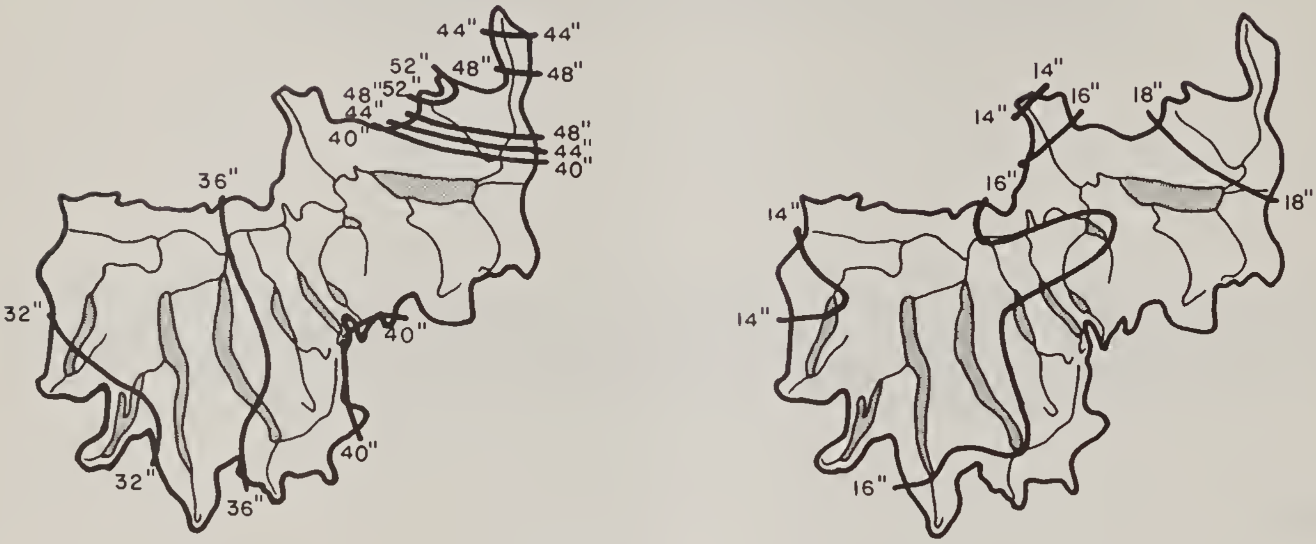
PHYSIOGRAPHY AND GEOLOGY

Three main physiographic regions are found in the Oswego River Basin. The northeast corner comprises the Tug Hill Plateau. The central part of the Basin is the Erie-Ontario Plain. Stretching across the southern area is the Allegheny Plateau. A minor segment of the Mohawk Valley touches the Basin in the east.

The Tug Hill Plateau area has gentle to moderately sloping, rolling to hilly landforms. Stony glacial till soils with fragipans are most common. Streams flow in a south or southeast direction.

The Erie-Ontario Plain has three distinct physiographic characteristics. The northwest and north segment is level to gently sloping, interspersed with innumerable steep-sided drumlin landforms. Soils in this segment are dominantly glacial till. The Barge Canal (the Seneca

FIGURE 3.1 - PRECIPITATION DISTRIBUTION IN THE OSWEGO RIVER BASIN, NEW YORK



Mean Annual Precipitation

Mean Growing Season Precipitation
(May 1 - September 30)

River in the east and the Clyde River in the west) divides this segment and streamflow is both north and south to the rivers. The southwest and southern area is characterized by gently to moderately steep rolling landforms. Glacial till soils predominate this area. Gently sloping, rolling landforms are found in the central and east sections of the plain. Lake-laid silty soils are most common, but clayey and sandy soils of lake-laid origin are extensive. Streams generally flow north or west.

The Allegheny Plateau has gentle to moderate sloping, rolling landforms. This area is dissected by narrow, steep-sided valleys. Streams usually flow to the north. Glacial till soils with fragipans predominate.

Elevation above sea level range from 246 feet, the mean level of Lake Ontario, at Oswego to 2,256 feet at Gannett Hill, town of Bristol, Ontario County.

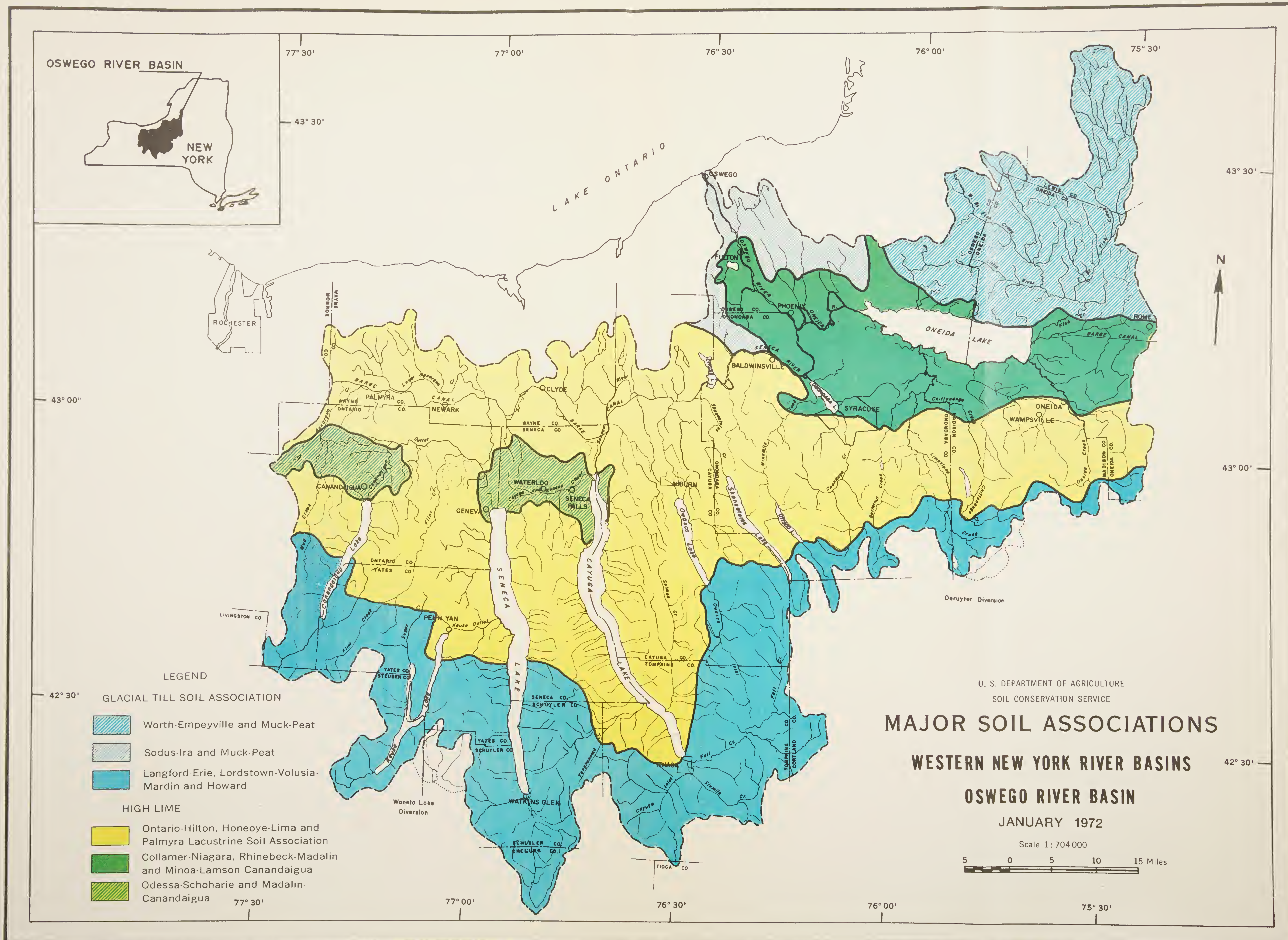
Along with Lake Ontario to the north, other important lakes in the area include Seneca, Cayuga, Canandaigua, Keuka, Skaneateles, Owasco, Otisco, Oneida, Onondaga, Cazenovia, and Cross Lakes.

Bedrock is composed of limestone, shale, sandstone, and siltstone with shales and limestones being the most common. Because of the slight dip of the bedrock formation to the south, exposures appear to lie in bands trending in the east-west direction.

Soil patterns in the Basin are separated into six major soil associations based on origin (Figure 3.2). Dominant soils are given although other significant soils occur within each of these areas.

Figure 3.3 shows the relationship of soil associations to topography. Glacial till soils dominate the uplands of the Basin. The stony Worth-Empeyville Association occurs in the Tug Hill Plateau in the northeast and Sodus-Ira along the Basin's north boundary. Muck-Peat Associations in both areas are small but agriculturally important. In the central part, Ontario-Hilton Association occurs in the drumlin areas, and Honeoye-Lima in the more rolling southern section of this area with the Palmyra Association in the valleys. Along the southern boundary are the Langford-Erie and Lordstown-Volusia Mardin Soil Associations. Occurring in the southern valleys is the Howard Association.

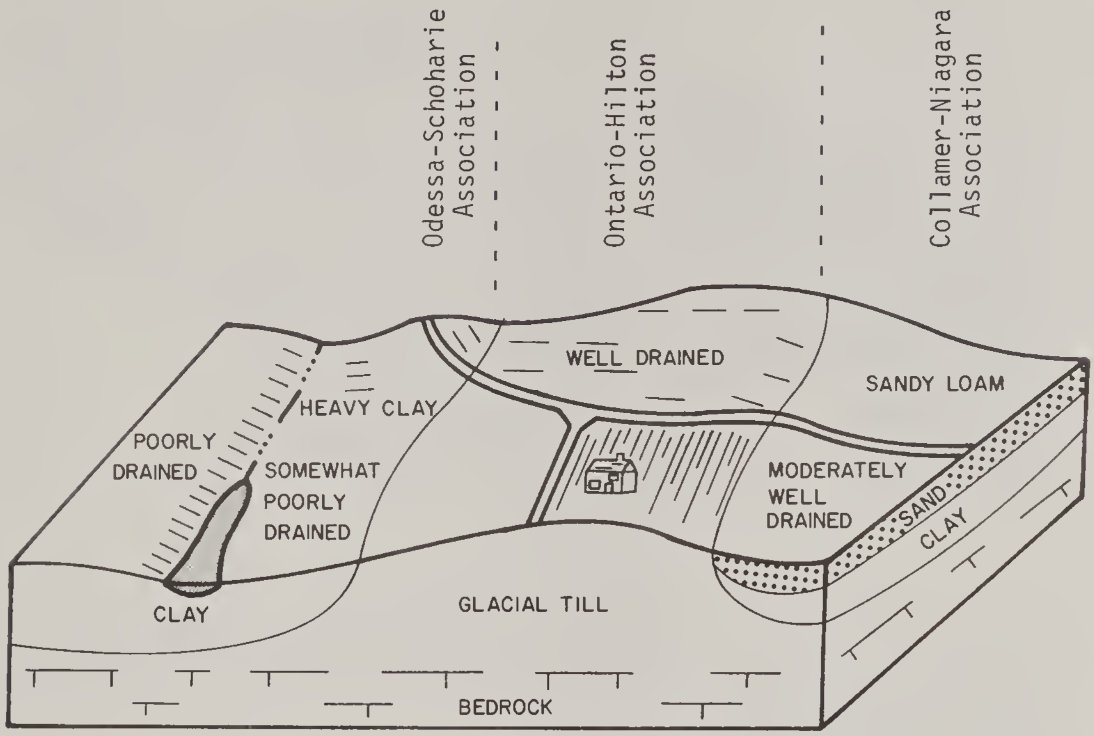
On the Ontario Plain, soil associations are of lacustrine origin. The area near Oneida Lake is mainly of the silty Collamer-Niagara, clayey Rhinebeck-Madalin and sandy Minoa-Lamson-Canandaigua Associations. Clayey Odessa-Schoharie and Madalin-Canandaigua are the associated soils in the small areas in Ontario and Seneca Counties.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 3.2

FIGURE 3.3 - RELATIONSHIP OF SOIL ASSOCIATIONS TO TOPOGRAPHY



Sand and gravel are the most abundant mineral resources found in the Basin. Outwash deposits left by the glacier are present in all areas and provide fill material for construction purposes. Several limestone quarries can be found in a belt across the Basin just north of the lakes and south of the New York State Thruway. Salt deposits are extensive and are used by industry in Onondaga, Ontario, Schuyler, and Tompkins Counties.

LAND RESOURCES

LAND RESOURCE AREAS

Broad areas of land having similar patterns of soils, climate, agriculture, native vegetation, water resources, topography, and land use are known as Land Resource Areas. These factors have influenced the agricultural and forest resources development of the Basin. According to the *Land Resource Regions and Major Land Resource Areas of the United States* 1/, there are three resource areas in the Oswego River Basin (Figure 3.4).

Most of the Basin area is in Resource Area L-101, the Ontario-Mohawk Plain of the Lake States Fruit, Truck, and Dairy Region. The largest farm acreage is in feed and forage crops in support of dairying. Farm production also includes significant amounts of cash, canning, truck, and fruit crops.

The second largest resource area is R-140, the Glaciated Allegheny Plateau and Catskill Mountains of the Northeastern Forage and Forest Region. Hay, pasture, and grain in support of dairying are the principal crops. Large areas of forest land composed of cut-over, mixed hardwoods are found at the higher elevations and on steep slopes.

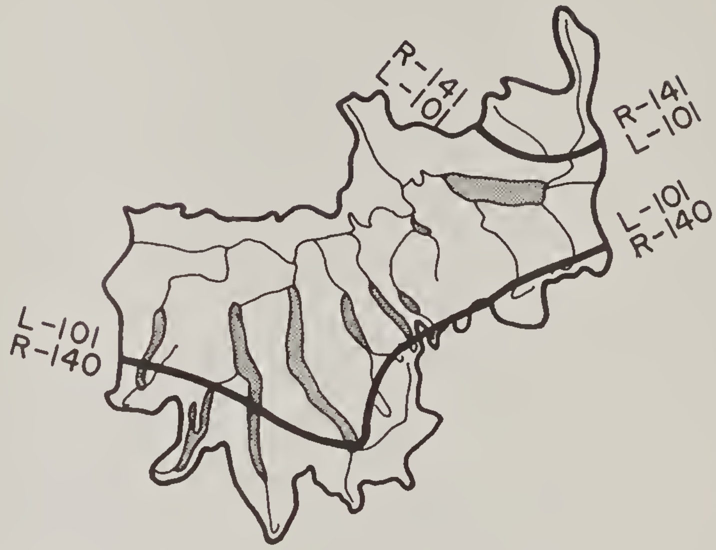
1/ Agriculture Handbook 296, Soil Conservation Service, USDA

FIGURE 3.4 - LAND RESOURCE AREAS IN THE OSWEGO RIVER BASIN, NEW YORK

LEGEND

L - Lake States Fruit, Truck and Dairy Region
  101 - Ontario-Mohawk Plain

R - Northeastern Forage and Forest Region
  140 - Glaciated Allegheny Plateau and Catskill Mountains
  141 - Tug Hill Plateau



Resource Area R-141, the Tug Hill Plateau of the Northeastern Forest and Forage Region is found in the northeast corner. Almost all the land is in cut-over mixed hardwood and conifer forests. Land Resource Areas correspond reasonably well with the physiographic regions.

LAND USE

Cropland makes up 38 percent of the Basin and varies from hay and grains to specialty crops such as onions, potatoes, and lettuce on the mucklands. Processing vegetables such as beans, beets, corn, and cabbage are extensively grown in southeastern Ontario County. Grapes are produced for wine manufacturing in the southwestern part of the Basin around Canandaigua, Keuka, and Seneca Lakes. Most of the cropland is related to general farming and dairy support. Crops include hay, grain, beans, and beets.

Thirty-seven percent of the land area is in forest cover. This forest land consists of many different characteristic associations, or forest types. The forest types reflect climatic and soil conditions as well as the influence of man's activity. The forests of this area should be visualized as consisting of an overall stand of northern hardwoods in which the other name types are found intermingled, and as patches. 2/ These forest types as shown on Figure 3.5 are northern hardwoods, spruce-fir, hemlock, elm-red maple, oak, and pine-oak.

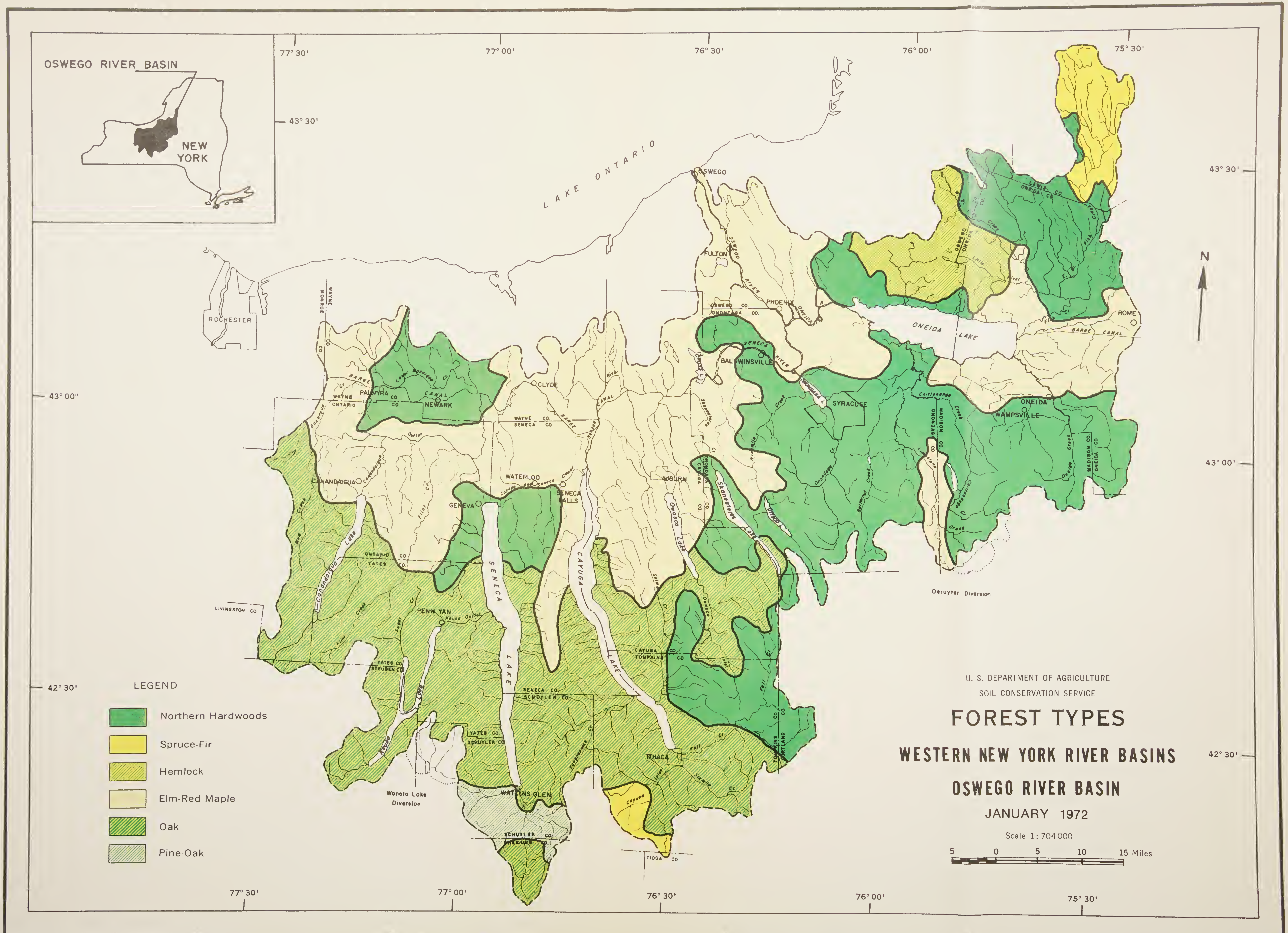
Pasture land comprises seven percent of the area. This land consists of improved grasses and legumes as well as "native" vegetation and is located on the steeper slopes especially in the Allegheny Plateau area.

Urban and other land make up the remaining 18 percent of the land area. Because of the population growth in the Basin, this figure is increasing. Land utilized for urban development is generally relatively flat but as the demand increases steeper land is urbanized.

The headwaters of most of the major water courses are forested. Land management practices on these headwaters may strongly influence the water resource in downstream regions. Downstream users are placing increasingly heavy and diversified demands upon this water for industrial and municipal water supplies, navigation, and as a waste-dispersion agent. Also, fresh, clear water for wildlife and recreation is rapidly becoming a prime necessity.

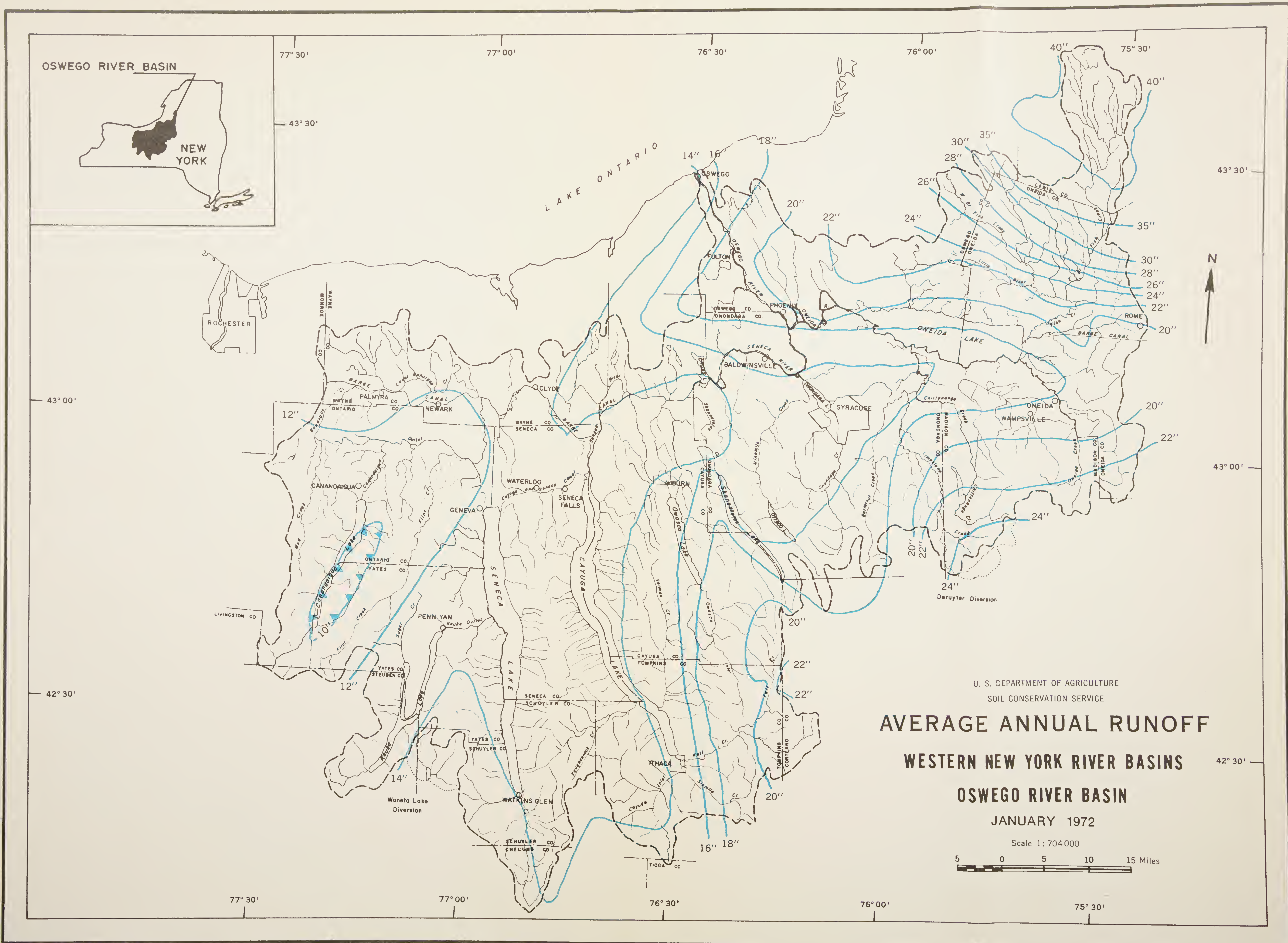
However, the water resources are not evenly distributed across the Basin. Most of the large lakes are in the western part of the Basin, while the larger amounts of rainfall occur in the

2/ Stout, Neil J., *Atlas of Forestry in New York*



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 3.5



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 3.6

east. Precipitation increases across the Basin from 32 inches annually in the west to 40 inches to the east. The Tug Hill area with 52 inches is the major exception. Surface water (runoff) yield follows the same pattern.

TYPICAL RURAL COMMUNITY

The most intense runoff occurs during the snowmelt period from February to April (Figure 3.6). Runoff is very slight during the summer months of June through August and accounts for less than 10 percent of the total. However, occasional summer storms result in severe runoff conditions, but the greatest chance for intense runoff occurs during the month of March and the least chance during August and September.

SURFACE WATER

Runoff from the western half of the Basin is between 10 and 14 inches annually (see Figure 3.6). Amounts increase to the east with a range of 16-24 inches annually. Approximately 18 inches is the average for the eastern half of the Basin exclusive of the Tug Hill area. More than 40 inches of runoff can be expected in the extreme upstream parts of the Tug Hill area. This amount decreases to 24 inches at the southeast edge of the Allegheny Plateau.

FIGURE 3.7 - GENERAL RUNOFF TRENDS IN THE OSWEGO RIVER BASIN

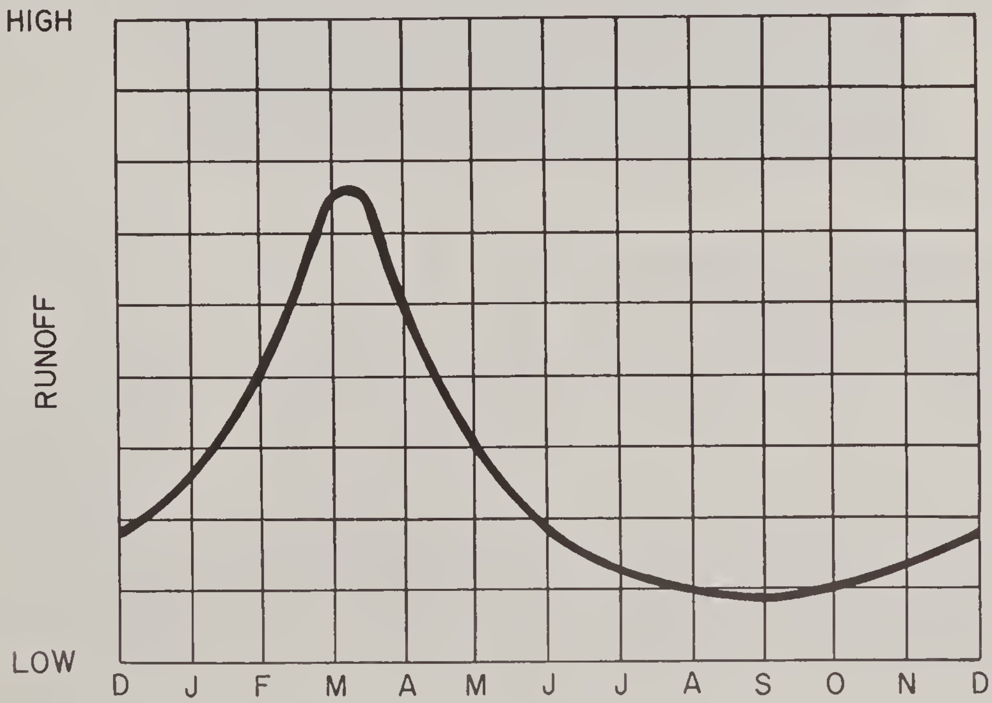


TABLE 3.1 - PRESENT LAND USE IN THE OSWEGO RIVER BASIN, NEW YORK

COUNTY	CROPLAND	PASTURE	FOREST	OTHER	URBAN	TOTAL
Cayuga	183,800	23,100	93,400	63,300	10,000	373,600
Chemung	5,600	1,400	15,000	6,200	-	28,200
Cortland	13,800	10,100	17,700	2,600	-	44,200
Lewis	4,000	3,000	57,000	3,000	-	67,000
Livingston	200	-	100	-	-	300
Madison	64,400	32,800	54,900	27,400	3,500	183,000
Monroe	1,300	-	300	400	-	2,000
Oneida	50,300	24,100	150,500	4,100	2,600	231,600
Onondaga	144,000	29,100	136,100	84,700	75,400	469,300
Ontario	170,400	18,500	83,400	51,100	10,400	333,800
Oswego	50,500	14,400	184,900	38,100	5,600	293,500
Schuyler	35,500	10,300	71,900	10,400	2,900	131,000
Seneca	129,500	2,400	38,800	33,500	7,000	211,200
Steuben	14,800	4,700	20,900	5,900	200	46,500
Tioga	500	-	500	-	-	1,000
Tompkins	109,000	17,700	113,900	20,100	7,600	268,300
Wayne	89,500	7,100	34,200	51,100	7,800	189,700
Yates	90,600	8,900	72,900	33,800	2,100	208,300
TOTAL	1,157,700	207,600	1,146,400	435,700	135,100	3,082,500
Percent of Total	37.6	6.7	37.2	14.1	4.4	100

Cropland - Land under cultivation within the past 24 months, including cropland harvested, crop failures, cultivated summer fallow, idle cropland, cropland used only for pasture, orchards, and land in soil improving crops.

Pasture - Land in grass or other long-term forage growth that is used primarily for grazing. Pasture includes all grazing land with the exception of pasture in crop rotation.

SOURCE

1954 New England-New York Inter-Agency Comm. Report
1964 Census of Agriculture
1964 Surface Water Records of New York State - USGS
1967 & 1968 Forest Survey Statistics of New York - USFS
1968 New York Soil and Water Conservation Needs Inventory

Forest Land - This includes (a) lands that are at least 10 percent stocked with trees of any size and are capable of producing timber or other wood products, (b) land from which trees described above have been removed to less than 10 percent and has not been developed for other use, and (c) plantations. (Forest tracts of less than 1 acre and isolated strips of timber are excluded.)

Other - All land not classified in one of the above categories. Includes farmsteads, farm lanes and country urban areas less than ten acres in size.

Urban - Areas within the legal boundaries of cities, and towns; suburban areas developed for residential, industrial, or recreational purposes; schoolyards; cemeteries; roads, railroads, airports; beaches; powerlines and other rights-of-way.

One of the major surface water resources are the numerous lakes, including the well known Finger Lakes. (Table 3.2 gives the surface area of the major lakes.) More than 290 square miles of surface area is available for water based recreation.

TABLE 3.2 - SURFACE AREA OF MAJOR LAKES IN THE OSWEGO RIVER BASIN, NEW YORK

Lake Name	Water Surface Area Square Miles
Canandaigua Lake	16.6
Cayuga Lake	66.7
Cazenovia Lake	1.8
Cross Lake	3.4
Keuka Lake	18.3
Oneida Lake	79.8
Onondaga Lake	4.6
Otisco Lake	3.5
Owasco Lake	10.6
Seneca Lake	66.6
Skaneateles Lake	13.6

Many towns are already using these lakes for municipal and industrial water supply. Lake Ontario to the north, although not in the Basin, is also a major source of water for the Syracuse metropolitan area.

As pressure and competition for use of surface water supplies increase, pollution becomes more of a problem and more people are becoming concerned. Raw or inadequately treated wastes, as well as sediment, surface runoff, and industrial spills are the major pollutants.

KEUKA LAKE - ONE OF THE FINGER LAKES

GROUND WATER

Much of the water used in the Basin comes from ground water sources. Ground water supplies are sufficient to meet most present and future rural domestic and livestock needs. They are not expected to be adequate for future municipal and industrial use except in a few of the smaller communities.

Unconsolidated stratified sands and gravels are the principal aquifers of the Basin. The best of these are connected to streams and are recharged as they are pumped. Yields vary but an average would be about 20 million gallons per day (mgd). Aquifers not connected with streams have lower yields usually between 1 and 20 mgd. The quality of these aquifers is generally considered good.

Bedrock sources of water are confined to limestone and shale units which crop out in a broad

band across the northern part of the Basin. Although there are potential high yield areas in these, it is difficult to predict where they will occur or how much they will yield.

The quality of ground water in the area is poor. High concentrations of minerals in the shales makes the water extremely hard, and in some instances, unpalatable.

WATER USE AND MANAGEMENT

Surface and ground water is used for domestic, livestock, and industrial water supply and for irrigation. In addition, surface water is managed for transportation on the Barge Canal and is available for numerous water-based recreational activities.

Many lakes are managed for many multiple-purpose uses. While the use of waterpower for generating electricity has been declining, the use of water for cooling purposes in generating electric power has been increasing. Also increasing is the use of the lakes for direct and indirect discharges of sewage and other waste materials.

Lake levels are regulated for flood control, canal navigation, power generation, water supply, water quality management and recreation. These levels are also important in managing waterfowl habitat in the Montezuma National Wildlife Refuge.

Water for irrigation is mainly from streams, wells, ponds, and the Barge Canal. Irrigation is practiced throughout the Basin with the heaviest concentration in the areas adjoining the Barge Canal.

Water-based recreation is available on all of the major lakes in the Finger Lakes Region and many of the smaller lakes and ponds. Activities such as boating, fishing, and swimming are available; however, public access areas to many of the lakes is limited.

Municipal and industrial water is being taken from Lake Ontario, Skaneateles, Otisco, Owasco, Seneca, Keuka, and Canandaigua Lakes. Many of the smaller villages are using ground water supplies.

Many streams are subject to pollution and their use is limited. In an attempt to identify water problems and needs, studies by many agencies have been carried out. Better water management will help to solve many of the problems which have been identified.

FISH AND WILDLIFE RESOURCES

FISH RESOURCES [3/]

The fishery of the Oswego River Basin is one of the richest in New York State. With 195,500 acres of water area, coupled with great variety of species and high productivity, the fishing fame has spread far beyond the Basin boundaries.

The Finger Lakes have long been noted for their excellent trout fishing. These lakes possess both cold water fishery - rainbow, lake, and brown trout, and a warm-water fishery of large and small-mouth black bass, yellow perch, pickerel, and associated species. The depth that prevails over the greater portion of the Finger Lakes provide conditions favorable for cold-water fish and at the same time confines the warm-water species to the upper layer of warm water.

Oneida Lake, unlike the Finger Lakes, is a relatively shallow body of water which has high fertility. The shoreline of Oneida Lake, which is extensively developed with cottages, beaches, and boat liveries, is low and flat with large swampy areas on all sides. Because of its fertility, the lake is extremely productive for warm-water game fish - bass, walleye, Northern pike, yellow perch, and non-game fish such as carp, burbot, alewife, sucker, and eel.

3/ Adapted from *New England - New York Inter-Agency Report*

There are about 12,600 acres of small warm-water lakes and ponds in the Basin. The quality of fishing in these waters varies from excellent to poor.

WARM-WATER FISHING ON SMALL POND

According to surveys conducted by the New York State Department of Environmental Conservation, there are approximately 7,000 miles of stream, of which 1,688 are considered of significant fishery value. Of the 1,688 miles, 1,430 are trout waters, 133 large-mouth bass waters, and 125 are small-mouth bass waters.

The rivers in the Oswego Basin are connected with the Barge Canal system. Water flow in the canal tends to be slow and the greater part of the system may be classified as warm-water fishery habitat, including large-mouth black bass, yellow perch, chain pickerel, carp and bullheads, as well as yellow pike-perch and northern pike in certain reaches.

Tributaries to the Finger Lakes provide spawning areas for both trout and warm-water species of the lake. Several tributaries support a permanent trout fishery of their own.

The tributaries of Oneida Lake include a number of important fishing streams which support both trout and bass. Some of the trout streams have ample natural reproduction, while others are heavily stocked. The lower reaches of all the tributaries of the lake serve as spawning areas for many of the species inhabiting the lake. Oneida Lake tributaries receive heavy fishing pressure except for the upper Fish Creek north of Oneida Lake where accessibility is difficult and fishing pressure is thereby reduced. In the case of the more popular trout streams, this pressure is far in excess of natural productivity and heavy reliance must be placed upon artificial stocking.

WILDLIFE RESOURCES

The Oswego River Basin supports a variety of wildlife species. Species vary according to regions as reflected by habitat factors such as land use, type of agriculture, native vegetation, and climate.

The majority of the Basin is in the lake plain region where cash crop and dairy farms are the major agricultural enterprises. Grain and hay fields with scattered wetlands, brushlands, and small woodlots provide excellent habitat for ringnecked pheasants, and cottontail rabbits. Deer, grouse, and gray squirrel populations are small as a result of the limited size of the woodlots.

Waterfowl is another valuable resource in this portion of the Basin. Ducks, geese, and marsh birds make extensive use of the many wetlands, lakes, ponds, and grain fields during migration. Many stay throughout the summer to raise their broods. The Montezuma National Wildlife Refuge and four state-owned Game Management Areas (Cicero Swamp, High Tor, Three-Mile Bay, and Howland Island Game Management Areas) are managed to provide resting, feeding, and breeding areas for waterfowl.

GEESE IN WILDLIFE POND

Dairy farming is the primary agriculture in the southern portion (Schuyler, Tompkins, Onondaga, and Madison County area). Few grain crops are grown and a considerable acreage of land is being retired from production and reverting to forest cover. Woodlots are of a moderate size. Thus there are fewer pheasants than in the Lake Plain Region. However, there are more rabbits, deer and grouse. A wild turkey population has been established in the area south of Ithaca where there are extensive forest land.

The northeastern portion of the Basin is heavily forested with only scattered dairy farms. This area supports the largest population of deer and grouse; snowshoe hare are common, and cottontail rabbits are found in scattered populations. Pheasants are found in only a few fringe areas.

SCENIC BEAUTY

The Oswego River Basin ranks high among the vacation areas of New York State. The resources of this area provide scenic and recreational opportunities.

Numbered among the principal recreational attractions are the large glacial lakes that dominate central New York, the innumerable stream gorges featuring beautiful cascades and waterfalls, the excellent fishing streams, a wide variety of agricultural enterprises, and crops on scenic rolling terrain, the wooded hills and mountains and the abundance of game. In addition, there are many excellent examples of ice-age geologic landforms, and pre-glacial bedrock formations.

The Finger Lakes are among the most interesting natural features of the Basin. These lakes were formed by glacial action and along with their short tributary streams have an interesting geology. The lakes are noted for their excellent boating and fishing, and have a long history of recreational use. The scenic charm of the Finger Lakes is enhanced by the high ridges flanking their shores.

The Basin is noted for its beautiful glens which are particularly characteristic of the Finger Lakes area. Many of these glens are deep stream gorges, reaching depths of from 200 to 500 feet and extend several miles into the surrounding hills. Scenic cascades and waterfalls are the most outstanding features of Watkins Glen and Taughannock Falls State Parks.

Oneida Lake, the largest lake in the Basin, covers an area of 80 square miles and is the largest body of water wholly within the state. In view of its size and its location with respect to large urban populations, it is a highly valuable recreational resource.

Unlike other river basins of comparable size in New York, the forests in the Oswego River Basin are not extensive, comprising about 37 percent of the Basin area. Intermingled with farms they are important scenic and recreational features and provide good cover for a variety of wildlife. The most heavily forested areas are found in the southern portion of the Basin, particularly along the ridges surrounding the Finger Lakes and in the Fish Creek Watershed which reaches into the Tug Hill area in the northeastern part of the Basin.

Extensive marshlands within the Basin have considerable value as wildlife habitat, particularly for waterfowl. Many marshes support a wide variety of vegetation of great botanical interest. Some of the marshlands have been set aside as wildlife refuges the two largest being Montezuma National Wildlife Refuge near Cayuga Lake and Cicero Swamp near Oneida Lake.

DESTRUCTIVE FACTORS

Environmental quality is being jeopardized through air and water pollution, misuse and abuse of land, indiscriminant destruction of native vegetation, and poor planning of urban, forested, and open areas and related facilities.

Urban areas with a concentration of industry create serious conditions by discharging pollutants into the air and water. The Syracuse metropolitan area is an example of this. Cities, villages and many industries are discharging inadequately treated or untreated sewage into streams, thus destroying this resource for other uses. A secondary problem also results from this situation. Algal growth is stimulated by the nutrients which reach the waters. This reduces the value of the water resource for other uses.

Probably one of the most obvious destructive factors is the carelessness of the population in keeping the aesthetics of the Basin pleasing to view. Open dumps and junk yards and litter serve to make the environment less desirable.

Indiscriminant destruction of native trees and shrubs during construction of housing units gives the development a "naked" and "stereotyped" look. Inadequate attempts are made to integrate open areas such as greenbelts, neighborhood parks, or recreational areas in developing communities. Moreover, community service facilities lack imaginative landscape planning.

Improper construction and maintenance techniques cause heavy losses of topsoil which is eroded and then deposited in ditches, culverts, streams and lakes. This sediment is detrimental to the fishery value of the stream and reduces the channel capacity.

CHAPTER IV

ECONOMIC DEVELOPMENT

HISTORICAL DEVELOPMENT

Waterways played an important role in the early economic development of the Basin. The Hudson-Mohawk Valley and the Susquehanna Valley were the main routes followed by settlers to reach the Basin and provided cheap transportation for the goods they produced to the eastern markets. Agriculture was the major economic activity in the early days.

The building of the Erie Canal, since modified, and which parts are now known as the New York State Barge Canal, was perhaps the monumental event in the historical development of the Basin economy. It led to the development of a commercial agriculture from what had formerly been a largely subsistence agriculture. It also gave impetus to economic development in other sectors.

Agriculture was the main stay of the economy until the Civil War. This was followed by a transitional period during which the nonagricultural sectors grew and urban centers expanded. By the turn of the century, the Basin economy was based primarily on nonagricultural activities in the well developed metropolitan centers.

Extensive land clearing for agricultural purposes was carried out during the last two centuries, except for the less accessible areas around the southern end of the Finger Lakes and parts of the Tug Hill Plateau in the northeastern section. During the height of the agricultural era, forest land throughout most of the Basin consisted mainly of small woodlots. These woodlots continued to grow in size as more and more land of marginal quality for farming is left to revert to forest cover. Reversion of much of this land to forests through artificial or natural stocking has been extensive since the middle of the last century due to the rapid decline in cropland acreage. This trend will continue as more agricultural lands become economically unfeasible to farm.

The Bankhead-Jones Farm Tenant Act of 1937 authorized the Secretary of Agriculture to acquire lands to correct maladjustments in land use. Approximately 13,259 acres of land were purchased under this Act in Schuyler and Seneca Counties, between Cayuga and Seneca Lakes. These lands, known as the Hector Land Use Area, were placed under the administration of the Soil Conservation Service in 1938. In 1954, this area was transferred to the U.S. Forest Service and the area has been an administrative unit of the Green Mountain National Forest since 1957.

GENERAL DESCRIPTION

The population of the 15 county Basin economic area 1/ was over 1.4 million in 1960 and is projected to reach 2 million sometime between 1980 and 1990. The Syracuse Standard Metropolitan Statistical Area, the principal metropolitan center, had a population of over 500,000 in 1960.

Total employment in the Basin economic area has grown steadily during the recent past and was over 500,000 in 1960. Manufacturing was the leading source of employment with over 175,000 employed followed by the service area with 118,000 and retail trade with almost 75,000. Employment in agriculture and forestry was about 30,000 in 1960.

1/ Delineated by the New York State Department of Environmental Conservation, Division of Water Resources, and includes those counties entirely or partly in the Basin. Data is for whole counties.

Major manufacturing industries are machinery, electrical equipment, transportation equipment, printing and publishing, food products, apparel, chemicals, and primary metals. The Syracuse metropolitan area is an important trading and distribution center for much of upstate New York.

The area is well provided with transportation facilities. The New York State Barge Canal traverses the northern part of the Basin. The highway system is well developed with two interstate highways crossing the Basin, one in a north-south direction and the other east-west. Main lines of the Penn-Central Railroad and the Lehigh Valley Railroad cross the Basin and also have numerous spur lines. The Basin is also served by several major airlines and a regional airline.

INTERSTATE HIGHWAYS AT SYRACUSE

AGRICULTURAL AND RELATED ECONOMIC ACTIVITY 2/

The Basin is one of the most important agricultural areas of New York. Over half has favorable climate, soils, and topography for agriculture. Good physical attributes, favorable location, good transportation facilities, and a large growing population assure ready markets for agricultural products. The Basin occupies about 10 percent of the area of New York and produces about 20 percent of the agricultural products.

Dairying is the major type of farming. The Basin represents about 14 percent of the agricultural land of the state and produces about 13 percent of the whole milk sold. The production of vegetables, fruit, field crops, poultry, and other livestock also make a significant contribution to the Basin's economy.

LAND BASE FOR AGRICULTURE

The poorer land for farming and poorer farms are going out of agriculture. The number of farms has been estimated to have decreased from slightly over 23,000 in 1940 to about 12,000 in 1968 for a decrease of almost 50 percent (Table 4.1).

2/ Summarized from Olson, Gerald W., Hardy, Ernest E. and Hunt, Charles S., *The Oswego River Basin: Inventory of Agricultural Production,* 1969, and Olson, Gerald W., et al *The Oswego River Basin: Projections of Agricultural Production,* 1969.

Acres per farm increased from 144 acres in 1940 to 164 acres in 1960. This indicates that some of the land from farms dropping out has been consolidated into the remaining farms. Table 4.2 gives further insight into this process; land in farms decreased by almost 420,000 acres from 1940 to 1960 while cropland harvested declined about 200,000 acres during the period.

In 1964, over 35,000 persons worked on farms at least part of the year in counties in the Oswego River Basin. Of these, about 4/5 were family workers including farm operators and unpaid family labor and the remainder were hired laborers.

TABLE 4.1 NUMBER OF FARMS AND ACRES PER FARM
IN THE OSWEGO RIVER BASIN, NEW YORK

COUNTY	NUMBER OF FARMS			ACRES PER FARM		
	1940	1950	1960	1940	1950	1960
Cayuga	2,833	2,376	1,772	105	123	159
Chemung	211	140	97	104	112	140
Cortland	250	219	168	168	192	254
Lewis	113	103	84	180	211	233
Madison	1,414	891	845	109	144	169
Oneida	1,362	1,142	708	118	128	178
Onondaga	4,293	3,169	1,686	87	104	142
Ontario	2,726	2,177	1,690	106	119	145
Oswego	2,337	1,610	439	90	99	120
Schuyler	803	780	489	107	124	164
Seneca	1,413	1,232	813	114	126	167
Steuben	279	225	166	118	121	146
Tompkins	1,788	1,467	953	105	124	162
Wayne	1,987	1,637	1,128	84	97	124
Yates	1,516	1,145	1,000	120	138	156
TOTAL	23,325	18,313	12,538			
AVERAGE				114	131	164

Source: Data calculated for the portion of a county in the Basin from 1940, 1950 and 1960 *Census of Agriculture* data for towns, published by the Department of Agricultural Economics at Cornell University.

TABLE 4.2 AREA OF LAND IN FARMS AND CROPLAND HARVESTED
IN THE OSWEGO RIVER BASIN, NEW YORK

COUNTY	LAND IN FARMS			CROPLAND HARVESTED	
	1940	1950	1960	1940	1960
	Acres				
Cayuga	303,435	296,533	286,591	154,938	147,625
Chemung	23,011	15,985	15,203	8,005	5,706
Cortland	31,815	35,217	32,156	11,621	11,311
Lewis	21,452	23,463	21,400	5,656	5,205
Madison	153,990	123,901	142,458	70,114	62,401
Oneida	149,835	144,437	121,602	52,248	41,237
Onondaga	350,741	311,519	234,280	168,418	108,972
Ontario	268,744	259,330	244,898	147,573	130,225
Oswego	189,126	163,114	116,832	59,642	32,739
Schuyler	86,253	104,775	86,365	34,936	27,782
Seneca	162,709	151,126	132,005	88,752	74,920
Steuben	35,807	30,644	22,169	14,531	10,187
Tompkins	195,488	181,155	149,059	77,915	60,416
Wayne	167,751	159,008	142,311	86,532	71,077
Yates	175,358	154,533	148,922	80,433	68,466
TOTAL	2,316,015	2,154,790	1,896,251	1,061,314	858,269
Reduction from 1940			419,764		203,045

Source: Data calculated for the portion of a county in the Basin from 1940, 1950 and 1960 *Census of Agriculture* data for towns published by the Department of Agricultural Economics at Cornell University.

The value of farm products increased from slightly over $81 million in 1940 to almost $107 million in 1960 (Table 4.3). Figure 4.1 shows the change in distribution of gross farm incomes for commercial farms between 1959 and 1964. The proportion of farms with gross receipts of over $40,000 almost doubled between 1959 and 1964. Farms with gross receipts between $10,000 and $39,999 also increased proportionately to the total while those below $10,000 declined.

TABLE 4.3 VALUE OF ALL FARM PRODUCTS SOLD
IN THE OSWEGO RIVER BASIN, NEW YORK 1/

COUNTY	1940	1950	1960
	- - - - - - - - - - - - - Dollars-	- - - - - - - - - - - - - - - - - - - -	
Cayuga	5,976,700	12,617,000	16,551,100
Chemung	181,900	515,600	597,700
Cortland	504,000	1,434,100	3,402,300
Lewis	183,700	580,100	714,500
Madison	2,474,800	6,679,700	9,303,400
Oneida	1,900,300	5,340,100	5,986,800
Onondaga	5,718,800	13,600,300	13,969,700
Ontario	4,384,100	10,916,200	15,054,900
Oswego	1,874,800	4,274,600	4,570,800
Schuyler	694,000	2,192,800	2,530,800
Seneca	1,918,700	5,288,500	6,145,600
Steuben	296,500	807,500	1,244,900
Tompkins	2,268,300	6,532,800	8,281,500
Wayne	3,388,800	8,021,400	10,816,500
Yates	1,914,500	5,552,500	7,640,600
TOTAL	33,679,900 2/	84,353,200 2/	106,811,100 2/
ADJUSTED TOTAL	81,168,600 3/	86,901,800 3/	106,811,100

1/ Total county data, *U.S. Census of Agriculture*, 1939, 1949 and 1959.
2/ Not adjusted for price level.
3/ Adjusted to 1960 price level. 1940=2.41, 1950=1.03, 1960=1.00.

While comparable data for the Basin is not available, the importance of farms with gross receipts of more than $10,000 is indicated by the following information for New York State. In 1964, 54 percent of New York State's commercial farms had gross receipts from the sale of agricultural products in excess of $10,000. The value of products sold from those farms was 86 percent of the total value of all products sold from all commercial farms, and 84 percent of the value of products sold from all New York State farms.

The growing importance of large scale commercial farms is further illustrated by the fact that farms with gross receipts of $40,000 or more produced almost 32 percent of the total value of all farm products sold by all farms, but represented less than 7 percent of farms.

Average values of land and buildings per farm and per acre for commercial farms in counties in the Basin are shown in Table 4.4. Values have increased significantly in most counties, with those near urban centers showing the greatest increases.

FIGURE 4.1 - DISTRIBUTION OF COMMERCIAL FARMS BY LEVEL OF GROSS RECEIPTS
OSWEGO RIVER BASIN, NEW YORK

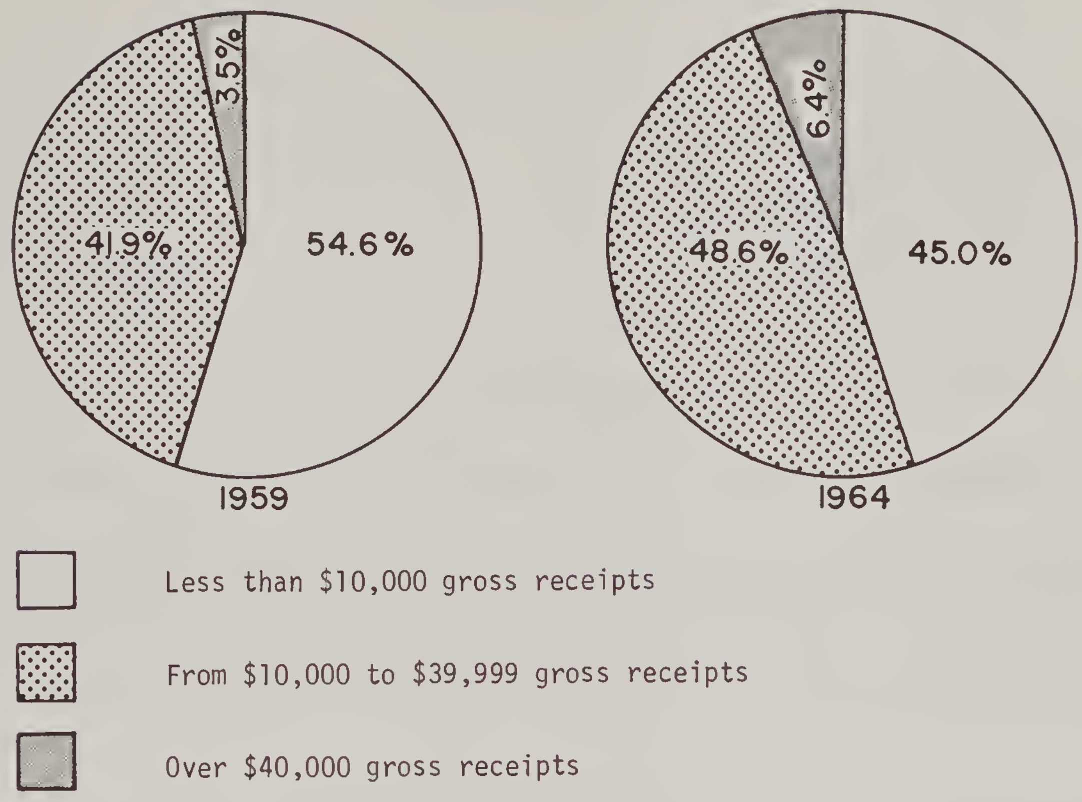


TABLE 4.4 - AVERAGE VALUE OF LAND AND BUILDINGS, COMMERCIAL FARMS, FOR COUNTIES IN THE OSWEGO RIVER BASIN, NEW YORK, 1959 AND 1964

COUNTY	AVERAGE VALUE PER FARM 1959	AVERAGE VALUE PER FARM 1964	AVERAGE VALUE PER ACRE 1959	AVERAGE VALUE PER ACRE 1964
	---------------------	-Number-	---------------------	
Cayuga	26,394	32,230	132	142
Chemung	24,470	35,888	138	143
Cortland	22,435	26,593	89	98
Lewis	16,335	25,581	63	102
Madison	23,207	31,538	109	133
Oneida	27,081	30,252	136	137
Onondaga	30,267	54,093	169	265
Ontario	28,899	46,833	148	222
Oswego	16,001	24,388	93	139
Schuyler	16,190	26,739	101	114
Seneca	26,660	33,430	127	136
Steuben	19,539	28,004	70	93
Tompkins	26,972	31,528	132	135
Wayne	25,079	35,897	176	206
Yates	22,138	31,191	131	145

Source: 1959 and 1964 *Census of Agriculture*

Well developed agricultural supply and marketing sectors support the farms of the Basin. Quantitative measures of the size and extent of manufacturers and other businesses supporting farms is difficult as many of these also are involved in nonagricultural activities as well. Some indication of the number of firms directly involved is given in Table 4.5.

TABLE 4.5 - AGRICULTURALLY RELATED MANUFACTURING FIRMS IN COUNTIES IN THE OSWEGO RIVER BASIN, NEW YORK, 1963

TYPE OF FIRM	NUMBER OF FIRMS
Meat Products	31
Dairy Products	141
Canned and Frozen Food	63
Animal Feeds	17
Wines and Brandy	5
Agricultural Chemicals	11
Farm Machinery and Equipment	13

Source: *Census of Manufacturers, 1963*

HISTORICAL PRODUCTION AND PROJECTED REQUIREMENTS FOR AGRICULTURAL PRODUCTS

Total agricultural production in the Oswego River Basin is dependent largely upon dairy farming and the crops produced in support of dairying. This relationship is expected to continue strong into the future. Production of cash crops has always been important on Basin farms and is likely to remain so in the future. Figure 4.2 and Figure 4.3 shows historical production and projected requirements for major crops, livestock, and poultry products. These will be discussed separately.

HISTORICAL PRODUCTION OF LIVESTOCK AND LIVESTOCK PRODUCTS

Dairy production has increased from 839 million pounds of milk in 1940 to almost 1.3 billion pounds in 1960, or about a 51 percent increase. During the same period, the increase was 53 percent for New York State. The Basin production represented 13.9 percent of New York State production in 1940 and 13.7 percent in 1960.

The production of beef and veal increased from almost 39 million pounds in 1940 to almost 57 million pounds in 1960 or over 34 percent. During the same period, New York State production increased only about 19 percent. The Basin production amounted to 11.6 percent of New York State production in 1940 and increased to 13.1 percent in 1960.

Sales of pork declined from over 7.5 million pounds in 1940 to about 7 million pounds in 1960, or a decrease of 5 percent. New York State production declined 21 percent during the same period.

Lamb and mutton sales decreased 37 percent from 3.5 million pounds to about 2.3 million pounds between 1940 and 1960. During this period New York State production declined about 25 percent.

Poultry meat production increased by 12 percent between 1940 and 1960 in the Basin while it increased by 15 percent in New York State during the same period. Egg production increased from over 203 million eggs in 1940 to over 236 million in 1960, which was about the same rate of increase for the entire state.

HISTORICAL PRODUCTION OF FIELD CROPS

Between 1940 and 1960 corn harvested for grain increased substantially from slightly over 2 million bushels to 6.2 million bushels or 142 percent. In 1940, the Basin produced about 31 percent of the corn harvested for grain in New York State and by 1960 this had increased to 42 percent. Corn harvested for silage increased by 8 percent between 1940 and 1960 in the Basin and by 4 percent during the same period in New York State.

Hay production in the Basin increased from almost 576 thousand tons in 1940 to almost 691 thousand tons in 1960 or a 20 percent increase. During the same period production in New York State increased over 44 percent.

FIGURE 4.2 - HISTORICAL PRODUCTION AND PROJECTED REQUIREMENTS FOR LIVESTOCK AND POULTRY PRODUCTS, OSWEGO RIVER BASIN, NEW YORK

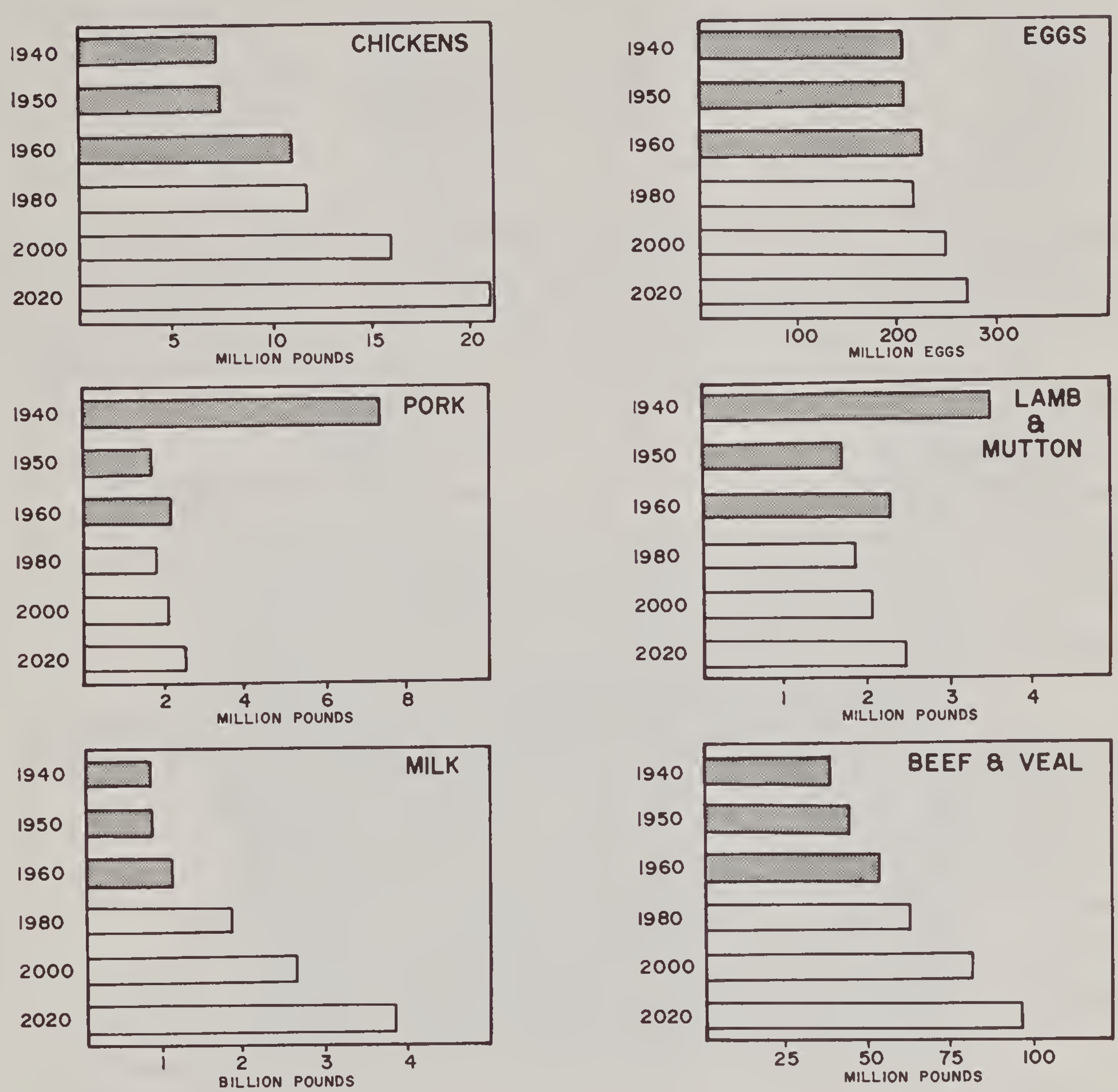
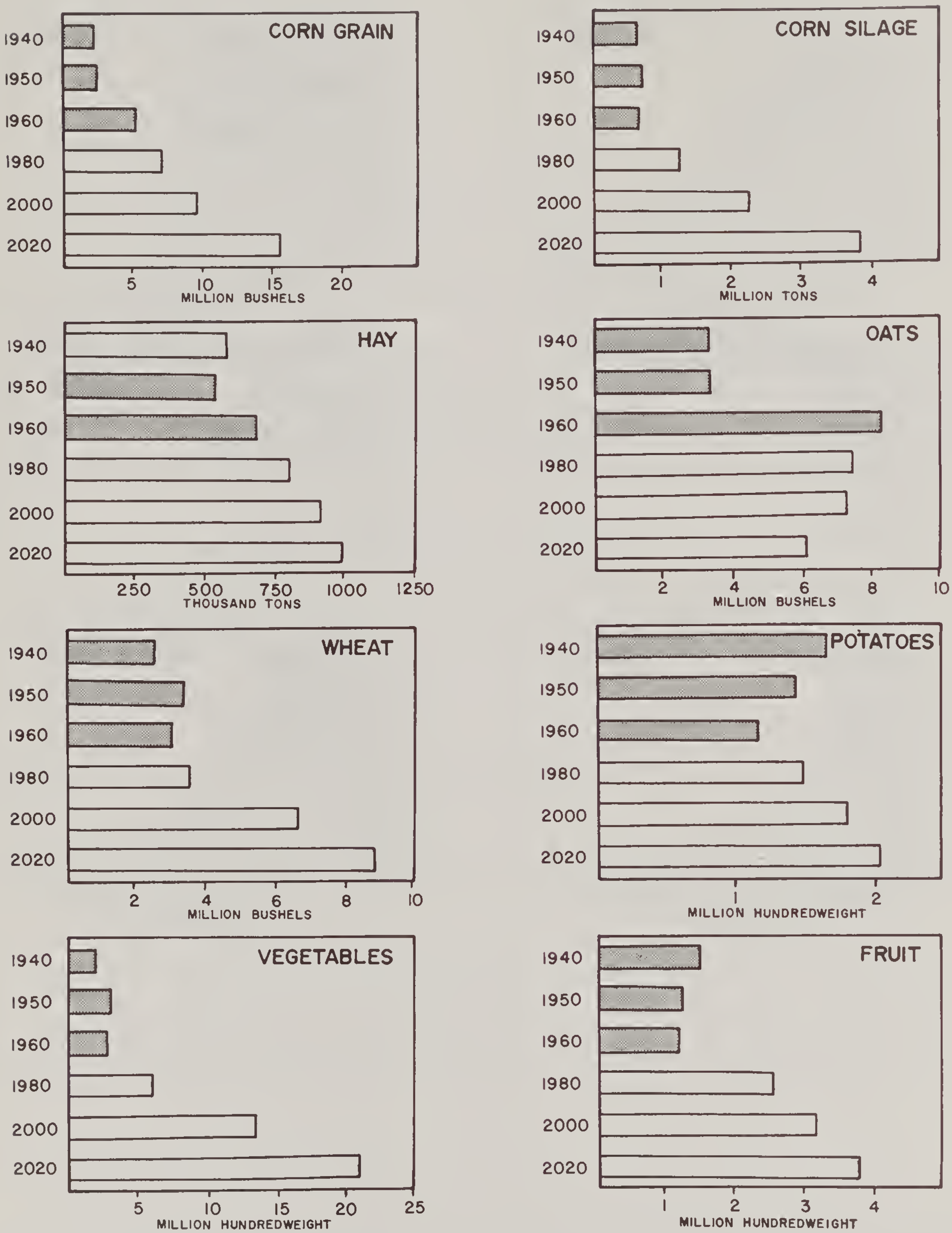


FIGURE 4.3 - HISTORICAL PRODUCTION AND PROJECTED REQUIREMENTS FOR MAJOR CROPS
OSWEGO RIVER BASIN, NEW YORK



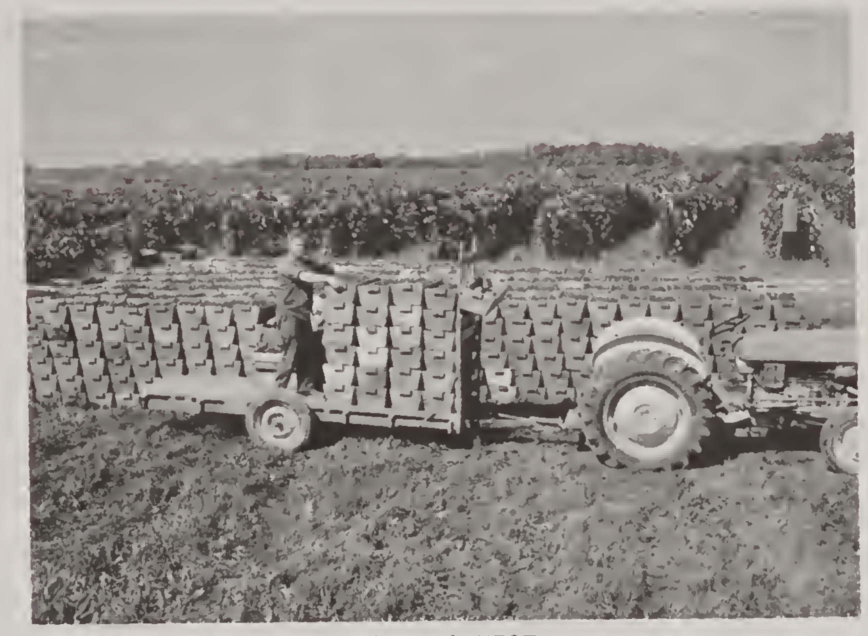
Oat production increased even more substantially than corn for grain during the 1940 to 1960 period, increasing over 148 percent from 3.3 million bushels in 1940 to 8.3 million in 1960. Production in New York State during the same period increased only 66 percent.

Wheat production increased 22 percent, increasing from 2.4 million bushels in 1940 to over 2.9 million in 1960. Forty-one percent of the wheat produced in New York State in 1960 was produced in the Oswego River Basin.

Potato production decreased significantly in the Basin during the 1940 to 1960 period while production in New York State was increasing slightly. The Basin decrease was almost 30 percent compared to almost 7 percent increase in New York State.

FRUITS AND VEGETABLES

Apples, cherries, and grapes are the most important fruits produced in the Basin. During the 1940 to 1960 period, apple production decreased almost 12 percent from 1.9 million bushels to almost 1.7 million bushels; cherry production decreased over 36 percent from 9.8 million pounds to 6.2 million pounds; and grape production increased over 3 percent from about 26.7 million pounds to 27.6 million pounds. Total production of fruit declined during the period from almost 1.5 million hundredweight to 1.2 million hundredweight.



GRAPE HARVEST

The major vegetable crops produced in the Basin are sweet corn, snap beans, cabbage, green peas, and dry onions.

Sweet corn acreage decreased from about 9,500 acres in 1950 to about 6,900 acres in 1960 or a 27 percent decrease. Cabbage acreage decreased about 39 percent from 4,600 acres in 1950 to about 2,800 acres in 1960. Snap bean acreage increased about 10 percent from 4,900 acres in 1950 to 5,400 acres in 1960. Acreage of green peas dropped substantially between 1950 and 1960, decreasing from 4,600 acres to 1,800 acres, or a 61 percent decrease. Dry onion acreage also dropped significantly from 3,100 acres in 1950 to 1,500 acres in 1960, or a 52 percent decrease. Total vegetable production increased from 2 million hundredweight in 1940 to almost 3 million hundredweight in 1960, reflecting improved yields that offset a general decline in acreage.

PROJECTED REQUIREMENTS FOR MAJOR CROPS, LIVESTOCK, AND POULTRY PRODUCTS

Future requirements for water in agriculture and the associated economic value will depend on several factors. Among these are:

1. The combined effect on national requirements for agricultural products of (a) population growth, (b) improved dietary standards resulting from higher levels of income per capita, and (c) expected shifts in exports of agricultural products.

2. Shifts in economic advantage between agricultural regions of the country.

3. Effect on the availability of land for agricultural production because of (a) expanding nonagricultural use of land for highways, houses, factories, etc., and (b) retirement of less productive land from intensive agricultural use.

4. Advancements in agricultural technology resulting in improvements in the production and utilization of crops and pasture.

5. Opportunities for more intensive use of agricultural land and resources resulting in increases in output and associated costs.

6. Opportunities for resource development resulting in increases in output and changes in cost.

Projections of needs for agricultural production were made as follows:[3/]

National projections of future needs for products based on assumed population growth, improvements in dietary standards, and expected changes in imports and exports were provided by the Economic Task Group of the Interim Water Resources Council. Middle Atlantic regional projections of future agricultural product needs were developed from the national projections by examination of past regional agricultural production trends relative to national production trends. These trends provide the basis for determining the Middle Atlantic's share of future national production requirements. The national projections take into consideration interregional shifts and comparative advantage of different regions.

Similarly, Basin requirements for future agricultural production were also developed by examining past trends in production as the basis for determining the Basin's share of Middle Atlantic production. Figures 4.2 and 4.3 show the projected requirements for farm products for the Basin.

Beef and milk production are closely related in the region because a majority of the beef produced comes from cull dairy cows. The trend in beef production as a percent of Middle Atlantic production has been continuously and gradually downward. The share of milk production declined between 1940 and 1950, but rose between 1950 and 1960. The Basin's share of Middle Atlantic milk production is expected to increase very slightly. The reason for this lies in the recent rapid growth of milk production in the cash crop area of the Basin.

Milk production from 1950 to 1960 increased 7.3 percent in Ontario County, while it increased only 2.8 percent in Oneida County, which has traditionally been oriented toward dairy production. The cash crop region has more land resources available for milk production than the traditional dairy areas of the Middle Atlantic region.

The slight decline in beef production will come about through a decline in the culling rate as new technology improves herd health, and improving production per cow results in fewer cow numbers needed to meet the projected output. The outlook for specialized beef production in the region, considering comparative advantages elsewhere, is not such that any adjustment to this production seems warranted at this time.

The Basin's share in egg production is projected to decline as it has in the past. Production of chickens has fluctuated, but is expected to decline at about the same rate as egg production. There has been some broiler production included in chicken production, but this has declined very rapidly so that now chicken production is mostly from the sale of old hens.

Pork, lamb, and mutton production is small compared with dairy production. They are projected to remain close to their current share of Middle Atlantic production. Any error in estimation here will have little effect on the use of Basin land resources.

The projected acreage of wheat and vegetables increases substantially in the later decade of the projection. The quality of the resources available in the Basin for producing wheat and

3/ For a detailed discussion of the method used see Hunt, Charles S., *The Oswego River Basin: Methodology Used in Making Agricultural Projections*, 1969.

vegetables is very good. New York State produces a special kind of wheat, soft white winter wheat, and should enjoy some advantage in the market with this product.

The situation in vegetable production is not as clear. Changes in production have been tied to the shifts in processing activity. Somewhat more than half of the employment in fruit and vegetable processing is in firms that have plants in other states. For them, it is fairly easy to shift production out of New York. Some companies have enlarged their businesses by consolidating with out-of-state firms. And, there is pressure to keep the industry scattered as this tends to reduce risk associated with bad weather conditions.

In the past, on the other hand, processing plants were closely oriented to the areas of raw product production. This reaction to risk may have worked more to the advantage of newer areas than to New York. However, some recent trends are encouraging for New York vegetable growers.

The extension of interstate highways throughout the east has allowed shipment of raw products over much longer distances. This would allow production to remain in New York even though processing plants are located elsewhere, since products may be shipped in from more distant points, taking advantage of differing harvest dates to extend the plant operating period. Raw production could specialize in crops particularly adapted to the Basin.

The projection for fruit production was one of the more difficult to make. The acreage in fruit declined very rapidly from 1940 (44,000 acres) to 1960 (22,000 acres), but very little from 1960 to 1965 (21,000 acres). While the acreage declined, the share of Middle Atlantic production rose slightly.

An important consideration in projecting fruit acreage and production is the suitability of the land resource and particularly the climate. Much of the decline in acreage in the Basin was due to the abandoning of orchards located in areas where the frequency of frost damage is too high for economical production. The cost of applying new technology necessitates an annual harvest of high quality and high yield. Marginal areas that have declined in production are the tree fruit areas around the Finger Lakes and in southern Wayne County. Grape production has increased in the Finger Lakes area where wineries have been expanding output. In the projection, the acreage of fruit was held constant in expectation of an expansion in grape acreage and a continued contraction of tree fruits around the Finger Lakes, but an increase of tree fruits near the urban areas around Syracuse where an expanding population will encourage production of fresh market fruit.

A COMPARISON OF PROJECTED REQUIREMENTS TO PROJECTED AVAILABILITY OF CROPLAND

The ability of the Basin's land resources to supply the projected production was evaluated by projecting the availability of cropland. Several sources of data were used to make these projections; including the *Conservation Needs Inventory of 1958* and the *Census of Agriculture*.

Past acreages of cropland harvested served as the basis for projecting cropland harvested. The trends were modified where necessary from information from the *Conservation Needs Inventory*.

Table 4.6 gives the projections for cropland harvested. In general, for the period from 1965 to 1975 for each county, the cropland harvested was projected to decline at the same rate as the 1960 to 1965 period. The period from 1975 to 2020 was projected to decline at a much slower rate, except for Onondata County where a large population growth will require land conversion at about the same rate as that experienced since 1945.

TABLE 4.6 - ACRES OF CROPLAND HARVESTED PROJECTED TO BE AVAILABLE BY DECADE TO 2020, OSWEGO RIVER BASIN, NEW YORK

1980	1990	2000	2010	2020
- - - -	- - - -	thousands of acres	- - - -	- - - -
668	632	597	561	525

By the year 2020, less than two-thirds of the 1960 cropland harvested is expected to be available for crop production. While this represents a substantial decline, it is not inconsistent with other projected declines in the Northeast. Most of the losses are expected to come from land that is not readily able to use modern farming technology. Some will move into urban uses, but much of it is expected to go into other rural nonagricultural uses as currently these uses are outbidding agricultural uses for this land.

The projected requirements for major farm products were converted into the quantity of land needed for their production through the use of projected crop yields and livestock feeding efficiencies. These are presented in Table 4.7. The 2020 yields were assumed reasonable if the projected yield was within 10-15 percent of maximum yields currently obtained by farmers.

The acres needed to meet projected requirements are presented in Table 4.8. The greatest increases in acreage would likely be in corn grain, corn silage (reflecting increased requirements for milk, wheat and vegetables).

A comparison of Table 4.8 (projected needs) and Table 4.6 (projected availability) indicates that projected requirements will exceed projected availability by 1980 and the gap will widen in successive decades until 2020 when needs are projected to exceed availability by one-third million acres. By the short-range planning goal of 1980, projected needs will exceed availability by over 87,000 acres.

It must be kept in mind that the projections are quite sensitive to the underlying assumptions. For instance, if the assumption concerning the ratio of corn silage and hay fed to dairy cows is changed and it is assumed that in the near future storage feeding of corn silage will be a universal practice, considerably less land will be needed to meet food needs (Table 4.9).

A comparison of the bottom two lines on Table 4.9 gives an indication of the needs availability situation if one assumed dairy cows were fed all corn silage and concentrates imported from outside the Basin.

The important point to recognize is that the projections represent what has sometimes been referred to as the *requirements game*. It is a demand study only in a very broad sense, with the terms *demand, need, requirement,* and even *use* and *consumption* used almost interchangeably. The projections provide a basis for anticipating pressures on resource use in the distant future. They may provide a basis for the expectation that some set of public resource development projects should be studied further. They have little to do with their actual justification.

With this in mind, it appears that in the Oswego River Basin we can anticipate some pressure on the land resource if the Basin is to continue to provide its historical share of national food and fiber production. This implies that irrigation, drainage and flood protection measures may be necessary if the Basin is to meet the implied objective of maintaining its historical share. Whether these measures would be economically feasible, however, may be a deciding factor relating to future resource development.

ESTIMATED NEEDS FOR IRRIGATION WATER

Based on estimates from the *Census of Agriculture,* in 1964, there were about 5,400 acres irrigated in the Basin.

Irrigation water needs were evaluated in two ways. First a projection was made based on historical data. These data were available for only three points in time - 1954, 1959 and 1964. The projection is presented in Figure 4.4.

This method largely ignores the underlying forces behind increasing adoption of irrigation. Ideally, a projection would be improved if the effect of these forces, both positive and negative, could be identified, quantified and included in the method of projection. A few of the obvious factors are weather, interregional competition and changing technology. Such forces have been very important in the recent past and can be expected to continue to play a major role in shaping future agriculture.

TABLE 4.7 - PROJECTED CROP YIELDS PER ACRE FOR SOME MAJOR CROPS IN THE OSWEGO RIVER BASIN, NEW YORK

Crop	Unit	1980	1990	2000	2010	2020
Corn grain	Bu.	82	94	108	120	132
Corn silage	Tons	14	16	18	20	22
Oats	Bu.	79	90	101	112	123
Wheat	Bu.	47	54	61	68	75
Hay	Tons	2.8	3.2	3.6	4.0	4.4
Vegetables	Cwt	154	176	198	220	242
Fruit	Cwt	112	128	144	160	176
Potatoes	Cwt	310	355	400	444	488

YIELDS IN FEED UNITS 1/ PER ACRE

	1980	1990	2000	2010	2020
Corn grain	4,592	5,264	6,048	6,720	7,392
Corn silage	5,600	6,400	7,200	8,000	8,800
Oats	2,228	2,538	2,848	3,158	3,469
Wheat	2,646	3,024	3,402	3,780	4,158
Hay	2,520	2,880	3,240	3,600	3,960
Pasture	574	590	650	820	1,000

1/ A feed unit is the substitution value of feeds for cows, with a pound of corn taken as the standard. The feed unit value of any other feed is the amount of feed that is estimated to have the same feeding value as one pound of corn.

TABLE 4.8 - ACRES OF CROPLAND AND PASTURE NEEDED TO MEET PROJECTED REQUIREMENTS FOR FOOD AND FIBER IN THE OSWEGO RIVER BASIN, NEW YORK

Crops	1980	1990	2000	2010	2020
	-thousand acres-				
Corn grain	85.4	87.5	89.3	113.6	116.8
Corn silage	91.6	110.9	126.8	147.3	172.0
Oats	95.2	83.9	73.0	62.1	48.7
Wheat	75.1	98.5	108.6	120.3	118.2
Hay	287.3	271.2	256.2	245.6	226.5
Vegetables	39.2	43.5	67.9	77.1	86.7
Fruit	22.7	22.5	22.2	21.8	21.4
Potatoes	4.8	4.5	4.5	4.6	4.2
Other Crops	54.1	55.7	58.1	61.7	64.2
TOTAL CROPLAND	755.4	778.2	806.6	854.1	858.7
Pasture	419.9	361.0	320.0	239.0	169.0

TABLE 4.9 - PROJECTED CROPLAND REQUIRED FOR AGRICULTURAL PRODUCTION UNDER VARIOUS ASSUMPTIONS OF CROP MIX, OSWEGO RIVER BASIN, NEW YORK

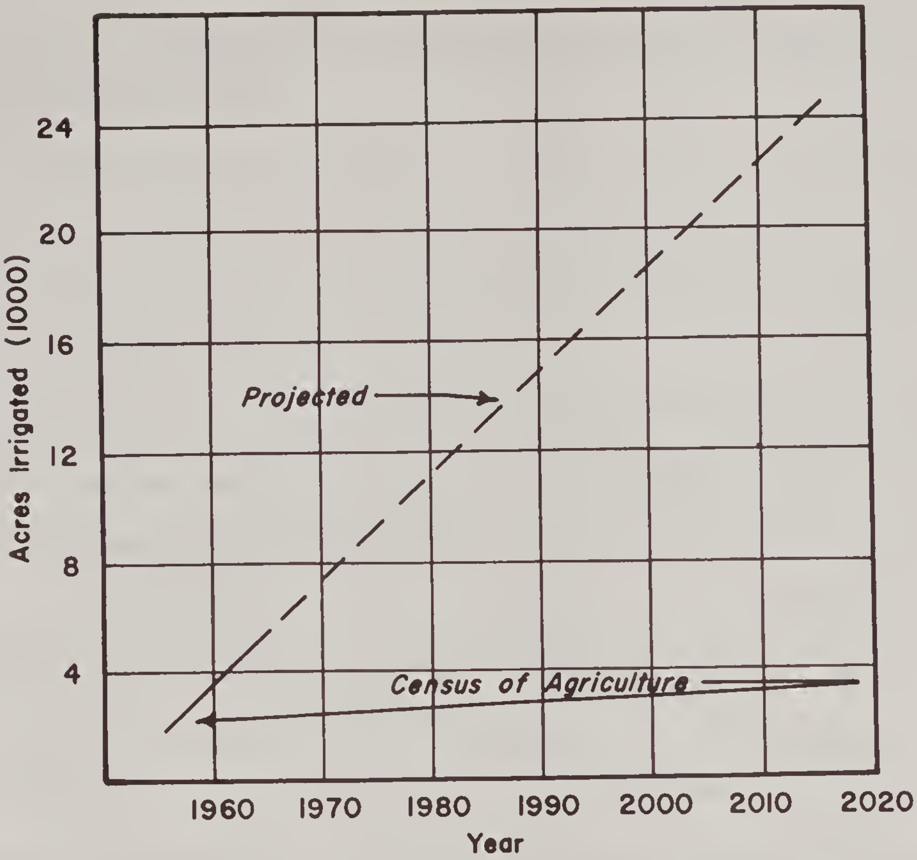
Crop Mix 1/	1980	1990	2000	2010	2020
	-thousand acres-				
All feed units from hay	587	592	602	628	652
All feed units from corn silage	264	266	271	282	293
Projected mix of hay & corn silage	379	382	383	393	399
Cash Crops 2/	173	202	239	264	273
Corn silage & cash crops 3/	437	468	510	546	566
Projection of cropland available	668	632	597	561	525

1/ Acres needed if all roughage feed units come from hay.

2/ Acres of cash crops include wheat, vegetables, potatoes, dry beans, and miscellaneous crops; does not include corn grain, oats, or fruit.

3/ Sum of second and fourth rows.

FIGURE 4.4 - ESTIMATED ACREAGE OF IRRIGATED LAND IN THE OSWEGO RIVER BASIN OF NEW YORK - 1954, 1959, and 1964 and PROJECTED TO 2020



The second approach to evaluating irrigation water needs focused on closing the projected production gap discussed previously. Considering only irrigation, with all other technological development held constant, the efficiencies in land use which can be gained through its application can reduce some of the pressure on the land resource base. For example, assuming a 25 percent increase in production through irrigation, the production gap projected for 1980 could be eliminated by irrigating 429,600 acres (Point A, Figure 4.5). By increasing irrigation to meet all expanding needs thereafter, all acres projected to be available for cropland would be irrigated shortly after 1990 (Point B, Figure 4.5).

Beyond this point, more acres would have to be irrigated than are projected to be available in order for the Basin to provide its historical share of national food and fiber production. Similarly, if a 50 percent increase in production through irrigation is assumed, the production gap projected for 1980 could be eliminated by irrigating 214,800 acres (Point C, Figure 4.5) and just before 2010, all projected acres harvested would be under irrigation (Point D, Figure 4.5). The above is summarized in Table 4.10.

FIGURE 4.5 - ALTERNATIVE IRRIGATION DEVELOPMENT SCHEME, 1980-2020
OSWEGO RIVER BASIN, NEW YORK

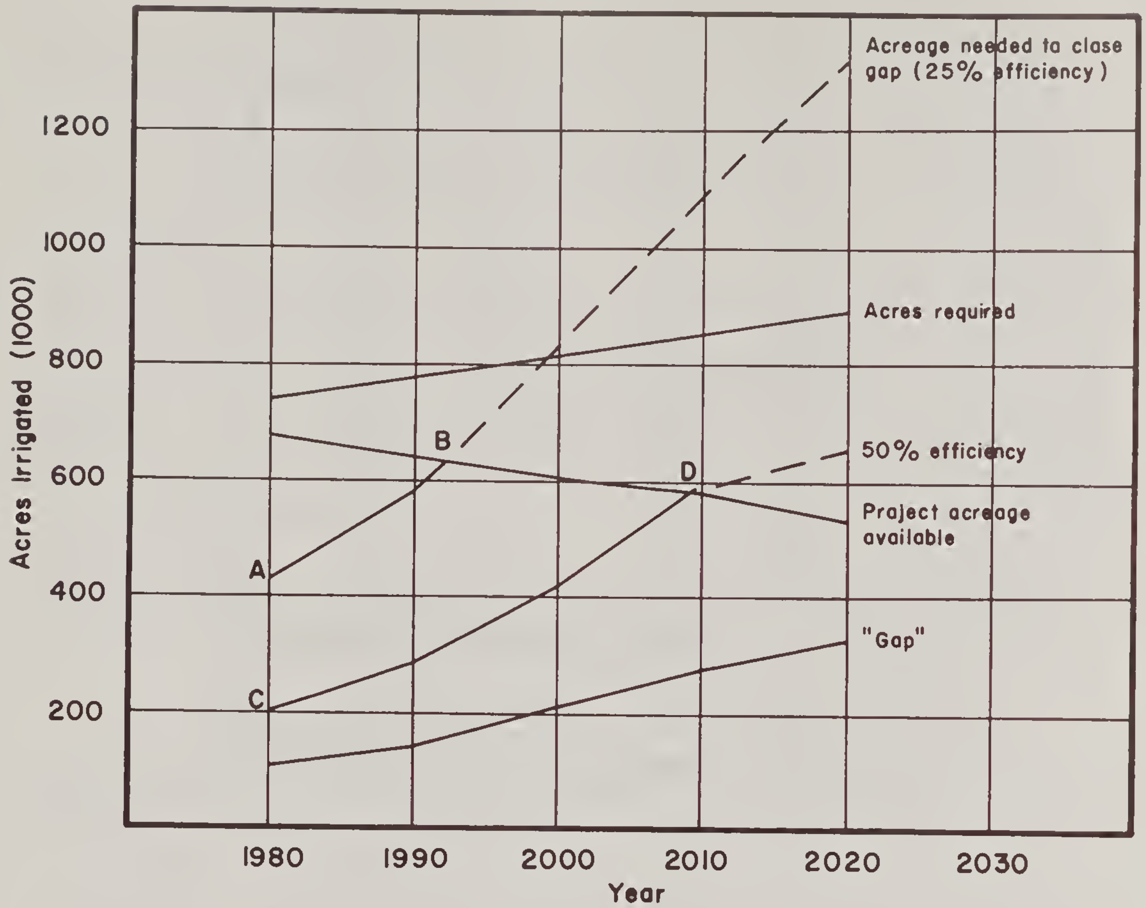


TABLE 4.10 ALTERNATIVE CROPLAND IRRIGATION DEVELOPMENT SCHEMES, 1980-2020
OSWEGO RIVER BASIN, NEW YORK

Year	Projected Acreage Required	Projected Acreage Available	"Gap"	Irrigation with 25% Efficiency 1/	Irrigation with 50% Efficiency 1/
	- - - - - - - - - - -	thousands of acres-	- - - - -	- - - - -	- - - - -
1980	755.4	668.0	87.4	429.6	214.8
1990	778.2	632.0	146.2	584.8	292.4
2000	806.6	579.0	209.6	2/	419.2
2010	854.1	561.0	293.1	2/	2/
2020	858.7	525.0	333.7	2/	2/

1/ Number of acres that would need to be irrigated to eliminate the gap between projected acreage required and projected acreage available.
2/ These amounts exceed the amount of land projected to be available at these times. The gap cannot be closed.

The above examples are not intended to represent a normative position of what should be done, but rather to emphasize the magnitude of the problem of closing the gap between projected acres required to provide the Basin's historical share of national food and fiber production and the projected availability of cropland harvested. Similar examples could be given for drainage and flood protection as they also have possibilities of increasing production from a given resource base. Expected returns from these alternative investments are needed in order to assess the possible contribution of such investments and to compare with irrigation. Also, the physical potential in the Basin for irrigation, drainage, and flood control development must be evaluated.

Obviously, if nonagricultural pressure on the land resource continues unabated, it is impractical to assume that anything like 429,600 acres will be irrigated in 1980. Also, it is unlikely that drainage or flood control can contribute substantially to closing this gap without concerted effort on the part of the agricultural industry. It is therefore quite likely that if the projections are close to representing future trends, the Basin will not be able to continue to provide its historical share of national food and fiber production.

The implication of the above is that in order to maintain or increase income to the region from the agricultural industry, investment in irrigation, drainage and flood protection should be given adequate attention and study along with technological developments and management techniques. The alternative strategy is to look to the other sectors of the economy to make additional contributions to compensate for the relative declining role of agriculture.

TIMBER RESOURCES AND RELATED ECONOMIC ACTIVITY

EXTENT AND NATURE OF THE RESOURCES

PRESENT CONDITION

Forests are one of the predominant land uses in the Oswego River Basin, involving 37 percent of the land area. Timber and other forest products removed from Basin forest lands contribute to the economy of the region. The most heavily forested areas are located in the northeastern part of the Basin in the Fish Creek drainage. There are also relatively large areas of forest land along the mountain ridges surrounding the Finger Lakes in the southern portion of the Basin. Throughout the remainder of the Basin, forest land is intermingled with farmland.

COMMERCIAL FOREST STAND

COMMERCIAL FOREST LAND

Ninety-seven percent of the forest is classified as commercial forest land (Table 4.11). These are lands which produce or are capable of producing crops of industrial wood and not withdrawn from timber utilization. (NOTE: Areas qualifying as commercial forest land have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Current inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

The remaining forest land is classified as noncommercial which is (a) withdrawn from timber utilization through statute, ordinance, or administrative order, but that otherwise qualifies as commercial forest land; or (b) incapable of yielding industrial wood products (usually sawtimber) because of adverse site conditions. Commercial forest lands provide industrial wood and other forest products, in addition to contributing to the water, recreation, and fish and wildlife resources. The extent that these lands will continue to supply sufficient resources will be influenced by land area, ownership pattern, degree of stocking, composition of stand sizes, future forest management programs, and landowner attitudes and interests.

TABLE 4.11 - ACRES OF COMMERCIAL AND NONCOMMERCIAL FOREST LAND BY PARTS OF COUNTIES IN THE OSWEGO RIVER BASIN, NEW YORK - 1968

County	Commercial Forest Land	Noncommercial Forest Land	Total Forest Land	Nonforest Land	All Land
			(In Acres)		
Cayuga	91,600	1,800	93,400	280,200	373,600
Chemung	15,000	-	15,000	13,200	28,200
Cortland	17,700	-	17,700	26,500	44,200
Lewis	51,400	5,600	57,000	10,000	67,000
Livingston	100	-	100	200	300
Madison	54,800	100	54,900	128,100	183,000
Monroe	300	-	300	1,700	2,000
Oneida	137,700	12,800	150,500	81,100	231,600
Onondaga	133,400	2,700	136,100	333,200	469,300
Ontario	82,500	900	83,400	250,400	333,800
Oswego	184,500	400	184,900	108,600	293,500
Schuyler	71,200	700	71,900	59,100	131,000
Seneca	37,800	1,000	38,800	172,400	211,200
Steuben	20,800	100	20,900	25,600	46,500
Tioga	500	-	500	500	1,000
Tompkins	112,500	1,400	113,900	154,400	268,300
Wayne	33,600	600	34,200	155,500	189,700
Yates	71,700	1,200	72,900	135,400	208,300
TOTAL	1,117,100	29,300	1,146,400	1,936,100	3,082,500

Source: 1967-1968 Forest Survey Statistics of New York - USFS.

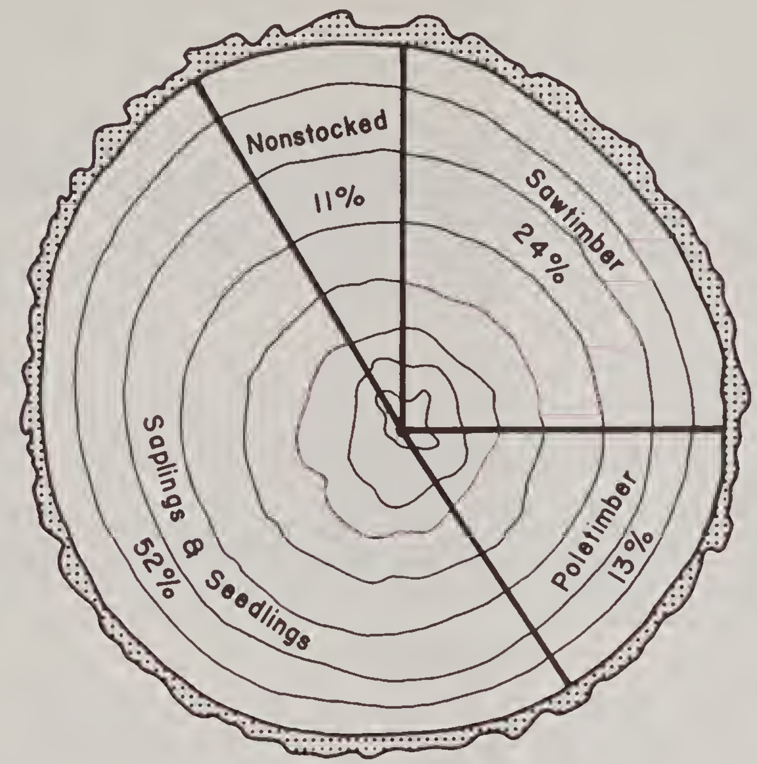
Commercial forest land in the Basin is classified as follows: 24 percent (265,800 acres) is sawtimber stands (Figure 4.6); 13 percent (140,800 acres) is poletimber stands; 52 percent (583,000 acres) is sapling and seedling stands; and the remaining 11 percent (127,400 acres) is in nonstocked forest land.4/ The large percentage in sapling, seedling and nonstocked stand size classes is mainly due to the continuing reversion of open land to forest cover.

The volume of growing stock is 953.5 million cubic feet, or 854 cubic feet per acre. Sawtimber volume totals 1.8 billion board feet and averages 1,615 board feet per acre.

Hardwood species account for 90 percent of the growing stock volume with the remaining 10 percent in softwood species. The sawtimber volume is 85 percent hardwood and 15 percent softwood.

4/ Based on Forest Survey Data - 1967 - U.S. Forest Service

FIGURE 4.6 - COMMERCIAL FOREST BY STAND SIZE CLASSES
OSWEGO RIVER BASIN, NEW YORK



In addition to the size, species composition, and accessibility of timber, timber quality is an important factor in determining what industries can develop and to what extent they will grow and prosper. One indication of timber quality is log grades. This is a classification of logs based on the external characteristics as indicators of the quality or value progressing from the best (grade 1) to the lower (grade 3) for factory grade hardwood logs. Log grades vary slightly from one species to another.

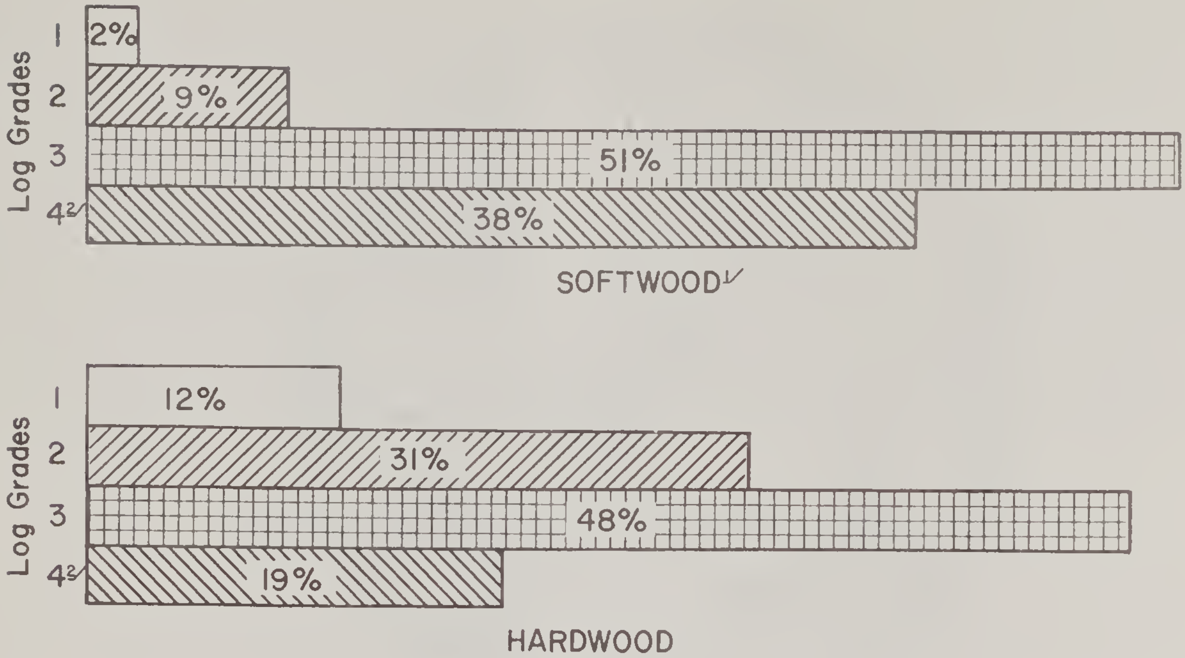
Only slightly more than a third of the hardwood timber and 11 percent of the softwood timber (pine species) is of a quality (Figure 4.7) which will sustain stable lumber and veneer industries.

The net annual growth of growing stock averages 30 cubic feet per acre and the net annual cut averages 10 cubic feet. For the Basin as a whole, the cut of all growing stock equals about 33 percent of the annual growth. For sawtimber, it is just under 88 percent of growth.

With less timber being cut each year than grown, the indications are that the Basin could contribute more in the way of timber production. The fact that more timber is not produced is a reflection of the market conditions, species composition, timber size, timber quality, landowner interests and attitudes, and alternative sources of income for the many small private owners.

Protection, management, and utilization of forest resources depends greatly on the decisions of private, nonindustrial landowners. This group, the majority of whom are engaged in occupations or enterprises not directly connected with forest management, own 91 percent (1,106,500 acres) of the Basin's commercial forest land. State and federal ownership accounts for 5.5 percent (57,800) acres with the remaining 3.5 percent (38,900 acres) in forest industry holdings.

FIGURE 4.7 - LOG GRADE PERCENTAGES, OSWEGO RIVER BASIN, NEW YORK



SOURCE: 1967-1968 Forest Survey Statistics of N.Y. - U.S.F.S.

1/ Species other than pines were not graded into standard-lumber log grades.
2/ Grade 4 logs are local use logs used for ties and timbers.

NONCOMMERCIAL FOREST LAND

Noncommercial forest land accounts for three percent, or 29,300 acres of the Basin's forested area. The majority of this area is in public ownership and is noncommercial due to restrictions on land use.

Approximately 9,600 acres of state-owned land is administered intensively for recreation by the State Office of Parks and Outdoor Recreation which permits no commercial cutting of timber. Approximately 15,000 acres of Game Management areas and 3,300 acres 5/ of wetlands are managed by the State Division of Fish and Wildlife. The forest land within these areas would be classified as noncommercial land. Other lands in this category such as steep slopes, mountain tops and wet swampy lands are incapable of producing or sustaining harvests of timber products. These noncommercial lands contribute to the quality of water, fish and wildlife habitat, and recreational resources.

PROJECTED CONDITIONS

Projections of the timber volume, growth, and cut assume that annual timber products output will rise; that wood will maintain its relative position in the national economy; and that utilization will improve - more of the wood cut will end up in useful products. Future changes in the forest resource situation depend on numerous forces and factors which make projections inherently speculative. The Basin's forests are capable of producing far more wood than anticipated through the year 2020. The future productivity of forest land will be largely determined by the degree of forest management applied. With 91 percent of the commercial forest land in many private, nonindustrial holdings, the decision of these landowners will determine

5/ *New York Statewide Comprehensive Outdoor Recreation Plan,* 1965.

the Basin's future forest productivity.

Land ownership is a key factor in assessing forest inventory trends and the outlook for future timber supplies. Public and large private owners tend to practice better forest management on their lands than many of the smaller owners. The great majority of the latter lack the skills and incentive or have more profitable investment alternatives.

Difficult problems of management often result from the many small holdings. Owners of these small tracts often have difficulty in selling timber products because of the small amounts available at any one time and the generally low quality.

Forest land area is expected to increase 7 percent 6/ to 1.2 million acres by the year 1980 and to nearly 1.3 million acres by the year 2000. After the year 2000, forest acreage will remain fairly constant.

While total forest land acreage is predicted to increase, the present acreage of commercial forest land is expected to decrease by about 5 percent, except for the northeastern portion which should remain fairly constant. This decline is expected due to the increasing restricted use of forest land for purposes other than commercial forest production.

Projections in timber growth assume that net annual growth will remain nearly constant. Annual growth will continue to exceed the annual harvest for most tree species through the year 2020. Most of the sawtimber cut will continue to be in the higher grades. Growing stock and the sawtimber inventories will increase (Table 4.12).

TABLE 4.12 INVENTORY OF GROWING STOCK AND SAWTIMBER AND PROJECTIONS FOR 1980, 2000, and 2020, OSWEGO RIVER BASIN, NEW YORK 1/

		Projections		
	1967	1980	2000	2020
Growing stock (million cubic feet)	953.5	1344.0	2416.2	4556.3
Sawtimber (million board feet)	1804.0	2025.8	2578.1	3384.4

1/ *Timber Resources of New York State.*

The present sawtimber cut of 30 million board feet is expected to remain stable throughout the projection period. The pulpwood cut, which at present is relatively low, is expected to increase in the future due to market demands outside the Basin.

FOREST INDUSTRY

Forest product industries are found in and adjacent to the Basin (Figure 4.8). There were 140 wood-using plants in operation in 1969. (See Table 4.13).

EMPLOYMENT

Projections indicate that employment in forest industries will rise from 7,400 to 10,190 by 2020 (Table 4.14). In the primary forest-based industry 7/ for the year 1969, 250 persons were employed in sawmills and planing mills, and 150 in pulp, paper and paperboard. The employment in pulp, paper and paperboard plants is expected to increase to 190 and the sawmill

6/ Based on conversations with State Forestry personnel.

7/ Plants which utilize logs, pulpwood or other fibrous materials are their basic raw material.

TABLE 4.13 - FOREST INDUSTRIES 1/
OSWEGO RIVER BASIN, NEW YORK, 1967

Kind of Industry	Number
Primary Industry 2/	
Sawmills	
in the Basin	39
adjacent to Basin that draw from it	28
Veneer & Plywood	1
Pulp, paper and paperboard	3
Subtotal	71
Secondary Industry 3/	
Millwork and Prefabricated Buildings	13
Wood Containers	5
Miscellaneous Wood Products	9
Furniture	17
Paper and Allied Products	25
Subtotal	69
TOTAL	140

1/ *New York State Industrial Directory* - 1969.
2/ *Directory of Primary Wood-Using Plants in New York State* - New York State, Department of Commerce & Department of Environmental Conservation - 1965.
3/ *Directory of Secondary Wood-Using Industries in New York State* - New York State Department of Environmental Conservation - 1969.

group decrease to 150 by the year 2020. The secondary forest industries 8/ employ most of the labor force. Although employment in millwork wood containers and miscellaneous wood products is expected to decline from 1,600 in 1969 to 950 by 2020, the overall employment in secondary industries is projected to increase from 7,000 to 9,850 by the year 2020. This segment of the industry has the greatest potential for increase.

MAJOR FOREST INDUSTRIES

PULP AND PAPER INDUSTRY

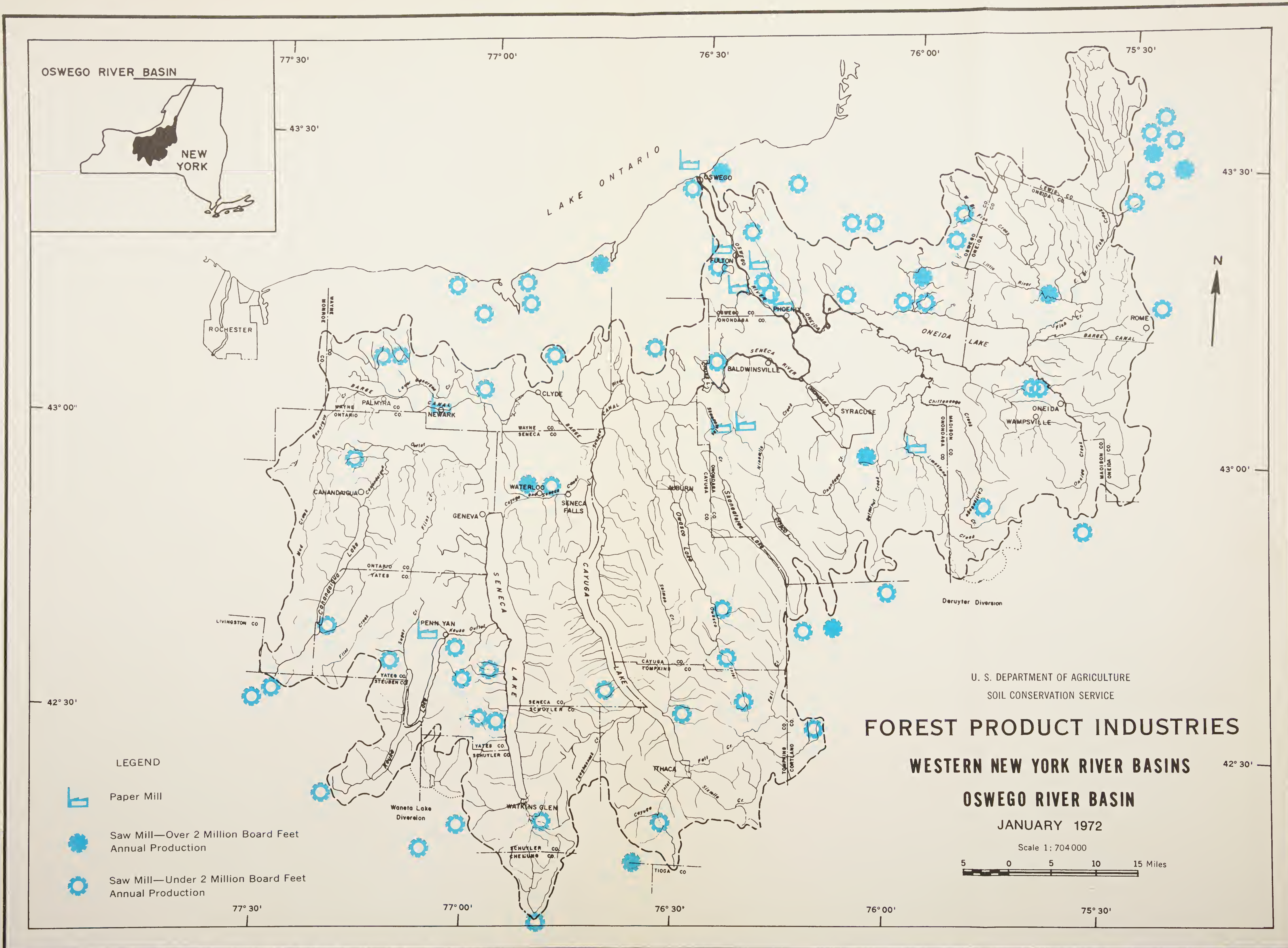
There are presently three relatively small paper mills in the Basin (Table 4.13). It is anticipated that these mills will increase their production capacity to improve their competitive position through modernization and expansion. No new pulp and paper industries are expected.

The availability of pulpwood in the Basin will increase in the future as sapling and seedling stands reach merchantable size. Wood pulp production in New York State is expected to triple by the year 2020 placing greater demands on this area for raw materials. As technology permits greater utilization of hardwood species, still further increases in pulpwood production are likely to occur.

LUMBER INDUSTRY

Sawmills are the most widely distributed forest industry in the Basin (Figure 4.7). Over half of the sawmills are small, producing less than one-half million board feet annually. However,

8/ All activities involved in the manufacture of lumber, plywood, paper and other wood products into finished goods.



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FOREST PRODUCT INDUSTRIES

WESTERN NEW YORK RIVER BASINS

OSWEGO RIVER BASIN

JANUARY 1972

FIGURE 4.8

there are 24 mills producing over a million board feet annually. These 24 mills account for 80 percent of the Basin's annual lumber production. The trend in recent years has been fewer, but larger sawmills. Lumber production is expected to remain constant through 2020.

Furniture Industry

There are 17 furniture and associated products plants in the Basin. Most of these plants are located in close proximity to the city of Syracuse.

With the projected increase in national population, the outlook is for a continuing increase in furniture production.

Miscellaneous Industries

There are 27 miscellaneous wood-using plants that produce millwork, prefabricated buildings, wooden containers, posts, handles, woodenware, pallets, dimension stock, etc. The demand for many of these products is expected to remain constant while others will decline as new products are developed.

Many other products are harvested from the forests of the Basin such as christmas trees, fuelwood, maple syrup and sugar products.

FOREST ECONOMY

In 1969, primary forest-based industries employed 400 persons who earned $2 million and produced goods valued at $8.2 million. Part of the value of shipments represents the cost of stumpage, logs, fuels, chemicals, and other intermediate products purchased from other sectors of the economy. When these costs were deducted from the value of shipments, the value added in primary manufacturing amounted to an estimated $3.2 million.

Total wages of nearly $1.8 million, values of shipments of over $7.7 million, and value added of over $3 million are estimated by 2020 in primary forest-based industries (Table 4.14). 9/

Secondary forest-based industry employed 7,000 persons in 1969 who earned wages totaling $34.4 million. Products valued at $185.9 million were shipped by these industries (Table 4.14). Value added amounted to $78.1 million. Paper and allied products accounted for 70 percent of these values. By 2020, wages are estimated to be $49 million, value of shipments are expected to be $294 million, and value added is estimated to exceed $118 million.

Capital expenditures for the forest products industries amounted to $1.3 million in 1967. 9/ The pulp and paper industry accounted for 63 percent of the capital expenditures.

In most areas of the Basin there is a shortage of woods labor due to competition from other industries. To meet the demands of forest industries for raw material, a substitution of capital for labor will be necessary, increasing mechanization of wood harvesting.

Current capital construction and operating costs are increasing for all forest industries. In the pulp and paper industry, this increase can be attributed to the continuing efforts of mills to meet federal and state requirements for greater pollution control and to the adoption of new technology. Pulp and paper mills in the Basin will likely spend increasing portions of their capital budgets for waste treatment facilities.

9/ *Census of Manufacturers, 1967*

TABLE 4.14 - PROJECTION OF EMPLOYEES, INCOME VALUE OF SHIPMENTS AND VALUE ADDED IN FOREST-BASED INDUSTRIES

Oswego River Basin, New York

	BASE YEAR				PROJECTIONS 1/											
	1967				1980				2000				2020			
	Number Employees	Income $1,000	Value of Shipments $1,000	Value Added $1,000	Number Employees	Income $1,000	Value of Shipments $1,000	Value Added $1,000	Number Employees	Income $1,000	Value of Shipments $1,000	Value Added $1,000	Number Employees	Income $1,000	Value of Shipments $1,000	Value Added $1,000
PRIMARY FOREST-BASED INDUSTRIES																
Lumber Manufacturing	250	1,001	3,900	1,479	215	861	3,354	1,269	190	761	2,964	1,121	150	601	2,340	885
Pulp, Paper & Paperboard	150	950	4,260	1,710	165	1,045	2,574	1,881	180	1,140	5,112	2,052	190	1,204	5,396	2,166
Subtotal	400	1,951	8,160	3,189	380	1,906	5,928	3,150	370	1,901	8,076	3,173	340	1,805	7,736	3,051
SECONDARY FOREST-BASED INDUSTRIES																
Millwork & Prefab Bldg.	450	2,664	9,495	4,095	400	2,350	8,440	3,640	340	2,174	7,174	3,094	260	1,528	5,486	2,366
Wood Containers	150	607	2,160	1,065	140	567	2,016	994	110	445	1,584	781	90	364	1,296	639
Misc. Wood Products	1,000	4,047	14,400	7,100	900	3,642	12,960	6,390	740	2,995	10,656	5,254	600	2,428	8,640	4,260
Furniture	900	4,285	11,790	7,380	960	4,571	12,576	7,872	1,030	4,904	13,493	8,446	1,100	5,236	14,410	9,020
Paper & Allied Products	4,500	22,865	148,050	58,500	5,080	25,811	167,132	66,040	6,300	32,010	207,270	81,900	7,800	39,614	256,620	101,400
Subtotal	7,000	34,448	185,895	78,140	7,480	36,941	203,124	84,936	8,520	42,528	240,177	99,475	9,850	49,170	286,452	117,685
TOTAL	7,400	36,399	194,055	81,329	7,860	38,847	209,052	88,086	8,890	44,429	248,253	102,648	10,190	50,974	294,188	120,736

1/ *Census of Manufacturers, 1967.*

CHAPTER V

WATER AND RELATED LAND RESOURCE PROBLEMS AND NEEDS

Water and related land resources are constantly changing and must be continuously appraised and studied if we are to use these resources wisely and eventually control them for man's benefit. This chapter provides an appraisal of the water and related land resource problems and needs in the Oswego Basin. Major emphasis is on the problems within the rural areas and on the needs which could be satisfied through United States Department of Agriculture programs.

Total average annual damage in the Basin from flooding urban and agricultural land exceeds $989,600. Of this total, $312,900 occurs to urban and lakeshore properties. Higinbotham Brook in the city of Oneida and Ley Creek in Syracuse are the main concentrations of urban damage. Agricultural flooding affects an estimated 45,000 acres of land, including over 29,000 acres along the New York State Barge Canal. Damage to crops along the Canal exceeds $123,000 and along streams more than $127,900 of damage occurs.

There are more than 1.1 million acres of potentially irrigable land within the Basin. At the present time only about 9,580 acres are being irrigated. Additional water will be needed if the estimated 100,000 acres are to be irrigated by 2020. There are also 280,000 acres of cropland and pasture which have drainage problems.

Land treatment measures are needed to reduce soil erosion, damage from excess water and improve unfavorable soil conditions. Conservation treatment will be needed on 683,730 acres of cropland, 141,560 acres of pasture land and 797,000 acres of forest land.

Erosion generally is not severe in the Basin. However, there are local areas which have major problems. Measures need to be taken to control these areas to reduce the amount of sediment reaching the streams and lakes, from roadside, urban development and cropland erosion.

Water quality problems exist in many areas of the Basin. Sewage, pesticides, and fertilizers are the causes with municipal and industrial sewage being the major pollutants. Common pollutants contributing to the problems are human wastes, food processing wastes, chemicals, oils, and dyes. The main areas of concern are the Syracuse-Onondaga Lake area, Finger Lake Outlets, Seneca River, Seneca Falls-Waterloo area, Barge Canal below Newark, and the Oswego River below Fulton.

Ithaca is the only major municipality with a water supply shortage at the present time. However, 29 villages are expected to have shortages totaling 312 mgd by 2020. Livestock and rural domestic needs are not chronic and Southern Cayuga County is the only area experiencing any significant problems.

Recreational problems are mainly concerned with the lack of accessibility to many public waters and a lack of land facilities for nonwater oriented recreation. More than 70,000 acres of developed recreational area will be needed by 2020. Preventing the destruction of wetlands is also a problem.

FLOODWATER DAMAGE

Floodwater damage occurring throughout the Basin are shown on Figure 5.1. In most cases these damages would be much greater if the characteristics of the Basin were different. The presence of the large Finger Lakes and the extensive undeveloped Seneca River marshes provide natural flood storage of great value to the Basin as a whole. Many of the subwatersheds are long and narrow, which also produces lower flood peaks.

FLOODING OF TRUCK CROPS ON MUCKLANDS

The most easily recognized flood damages occur in some of the smaller urban areas - villages and hamlets - where urban encroachment on small stream flood plains has taken place. Inadequate maintenance of stream channels, bridges, and culverts has often contributed to these problems. Shoreline development on both lakes and river banks has been damaged by flooding of infrequent occurrence.

Although most streams have flooding problems, nineteen watersheds were designated for study in detail to determine their potential as PL-566 projects (Figure 5.2). Six of these areas have concentration of urban damages and thirteen have primarily agricultural damages.

Total average annual damage from flooding urban and agricultural lands exceeds $989,600.

AGRICULTURAL

Agricultural flood damages, while significant in some localized situations, are in general comparatively low. The most susceptible acreage is the muckland truck farms which also have the highest damageable value per acre. Mineral soil flood plains are narrow, are usually associated with the predominant dairy farming enterprises, and are utilized for lower value forage crops or pasture. These often have other problems of a limiting nature, such as poor drainage, difficult soils to till, and small sized or irregular shaped fields which do not permit the most efficient use of modern tillage or harvest equipment. In general, these have a comparatively low damageable value per acre.

Distribution of flooding also contributes to the low agricultural damages that occur. The probable floods have a 60 percent chance of occurring in the winter and early spring months - November through March. April, when field work usually begins, has a 16 percent probability. These months with the highest probability of flood occurrence have the least damageable value. The growing season flooding that may occur has quick peaks which cause only brief inundation and low agricultural damage on most of the flood plains. The exceptions are the mucklands and flood plain along the Seneca River.

Agricultural flooding affects an estimated 45,000 acres of land, including over 29,000 acres along the New York State Barge Canal. Damaged to the crops on the muckland and low-lying

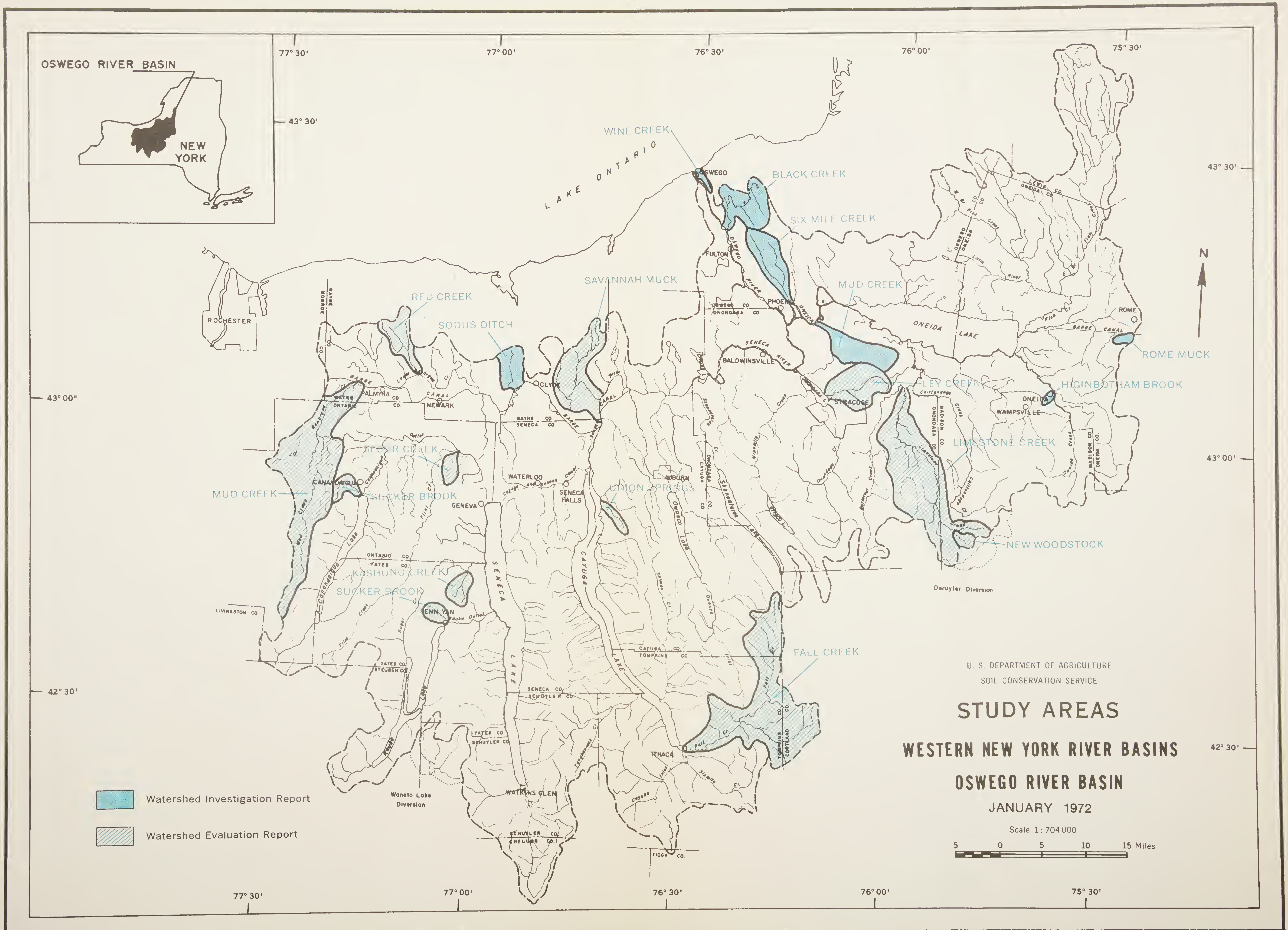


FIGURE 5.2

USDA-SCS-HYATTSVILLE, MD. 1973

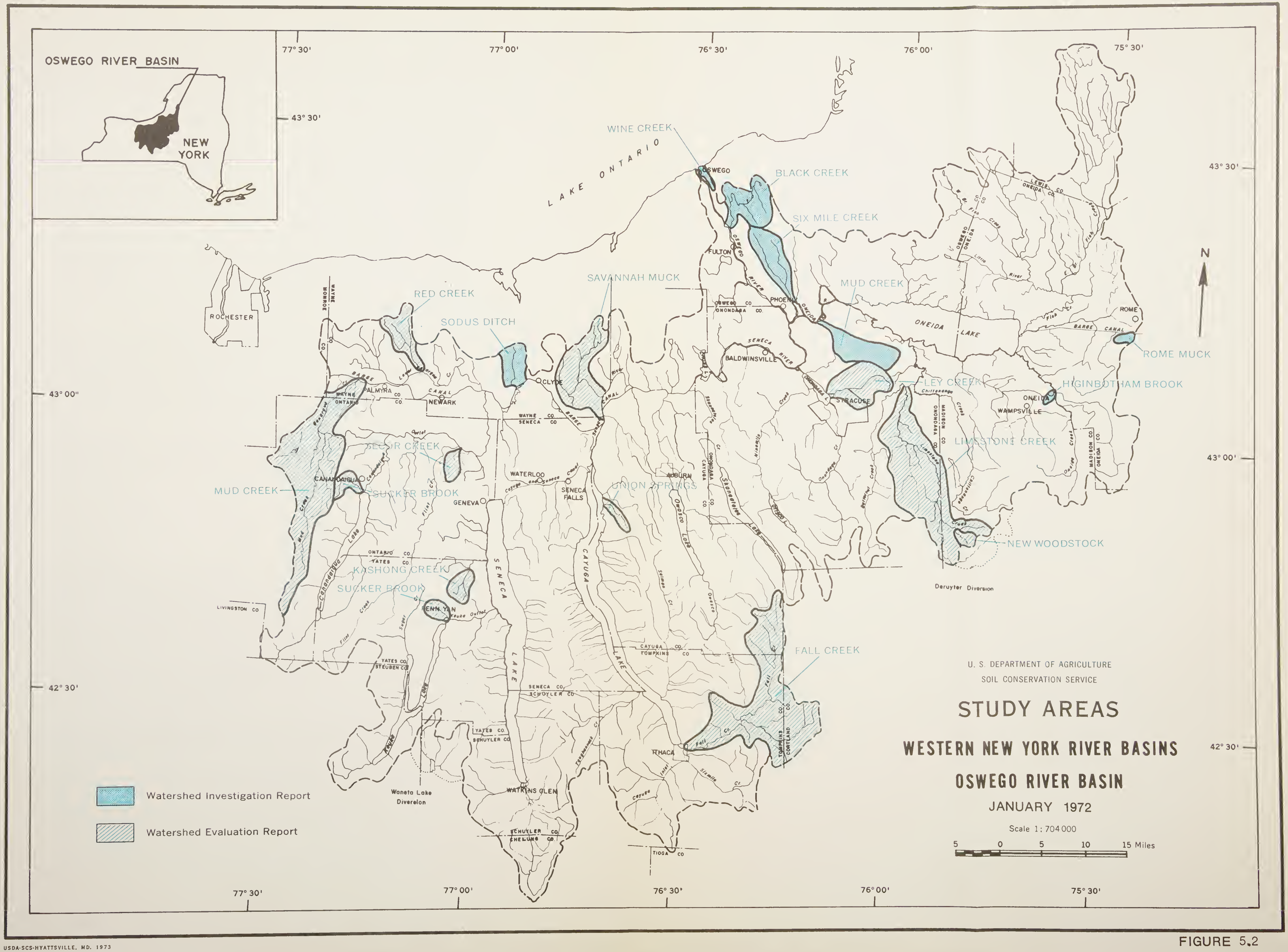

OSWEGO RIVER BASIN
NEW YORK
LAKE ONTARIO
WINE CREEK
BLACK CREEK
SIX MILE CREEK
SAVANNAH MUCK
MUD CREEK
RED CREEK
SODUS DITCH
ROME MUCK
LEY CREEK
HIGINBOTHAM BROOK
LIMESTONE CREEK
SECOR CREEK
MUD CREEK
SUCKER BROOK
UNION SPRINGS
NEW WOODSTOCK
KASHONG CREEK
SUCKER BROOK
FALL CREEK
ROCHESTER
OSWEGO
FULTON
PHOENIX
BALDWINSVILLE
SYRACUSE
ROME
ONEIDA
WAMPSVILLE
CLYDE
NEWARK
PALMYRA
CANANDAIGUA
GENEVA
WATERLOO
SENECA FALLS
AUBURN
PENN YAN
WATKINS GLEN
ITHACA
ONEIDA LAKE
SENECA LAKE
CAYUGA LAKE
Deruyter Diversion
Waneta Lake Diversion
Watershed Investigation Report
Watershed Evaluation Report
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STUDY AREAS
WESTERN NEW YORK RIVER BASINS
OSWEGO RIVER BASIN
JANUARY 1972
Scale 1: 704 000
5 0 5 10 15 Miles
USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 5.2

mineral soils along the canal are estimated to exceed $123,000 yearly. The damage estimate to crops along the 125 miles of streams amounts to another $127,900. This damage estimate is small compared to the potential production value that might accrue if the flood threat were removed from these lands and the drainage was improved to permit growing adapted crops.

TABLE 5.1 - MAJOR UPSTREAM DAMAGES IN THE OSWEGO RIVER BASIN, NEW YORK

Subwatershed Number	Subwatershed Name	Drainage Area (Sq. Mi.)	Acres Damaged	Annual Flood Damages (dollars)
12	Higinbotham Brook	1.6	(urban)	16,000
88	Mud Creek	31.1	140	13,800
127	Rome Muck	5.2	685	41,000
433	Wine Creek	8.3	385	23,000
454	Sodus Ditch	10.2	3,000	37,000
426	Six Mile Creek	27.9	425	34,000
433	Black Creek	31.4	250	26,700
463	Ley Creek	29.5	(urban)	98,000

NONAGRICULTURAL

Urban flood damages have been reported in several villages and cities including Syracuse. Ley Creek is the principal flooding problem in the Syracuse area. Limestone and Butternut Creeks in Onondaga County cause substantial urban damages in this same region. Part of the city of Oneida suffers damage from Higinbotham Brook, a small tributary to Oneida Creek. Relatively minor flooding is reported in Union Springs, Cayuga County; in Penn Yan, Yates County; in Canandaigua, Ontario County; in Marion, Wayne County; all due in part to inadequate channel or bridge capacity, debris, ice jams, or encroachments on the flood plain.

The city of Ithaca at the head of Cayuga Lake, reports a damage from Inlet, Fall, and Six Mile Creeks. Virgil and Egypt Creeks, tributaries to Fall Creek, cause flood damages in the village of Dryden. Watkins Glen, in Schuyler County, has reported damages in the past.

IRRIGATION

The Basin is similar to most areas of the humid Northeast in that rainfall patterns, amounts, distribution, and time of occurrence are erratic. In most years, there are usually several periods during the growing season when rainfall is not sufficient to replenish soil moisture for optimum crop growth. Furthermore, not all rainfall is effective. Effective rainfall can be defined as that part of the total rainfall which does not run off but enters the soil and is available for plant use. An average of nine additional inches of gross irrigation water is needed to insure good crop yields and a quality product.

Most of the stream flow from rainfall and snowmelt runoff occurs during the nongrowing season. Some streams are dry and others are at their lowest discharge or at minimum levels for other purposes during portions of the growing season. This limits the amount of irrigation which can be done by direct withdrawal from stream flow.

Along with streams, irrigation water is also being obtained from wells and ponds. However, wells often do not provide an adequate supply during the growing season. Ponds usually have inadequate capacity and lack the ability to be recharged by ground water.

There are more than 1.1 million acres of potentially irrigable land within the Oswego River Basin. At the present time only 9,580 acres are being irrigated.

The location of the land presently irrigated is summarized in Table 5.2. Appendix C contains more detailed information concerning land presently irrigated.

TABLE 5.2 - IRRIGABLE LAND BY COUNTY IN THE OSWEGO RIVER BASIN, NEW YORK

County	Irrigable Land (acres)	Land Presently Irrigated (acres)	County	Irrigable Land (acres)	Land Presently Irrigated (acres)
Cayuga	189,200	440	Ontario	159,900	770
Chemung	4,300	130	Oswego	90,000	1,320
Cortland	6,600	0	Schuyler	20,300	70
Lewis	5,100	0	Seneca	73,200	410
Madison	70,900	320	Steuben	5,600	0
Monroe	2,400	0	Tompkins	65,200	1,030
Oneida	82,400	870	Wayne	82,500	1,870
Onondaga	166,800	1,990	Yates	88,700	360

BASIN TOTALS: 1.1 million irrigable acres
9,580 acres presently irrigated

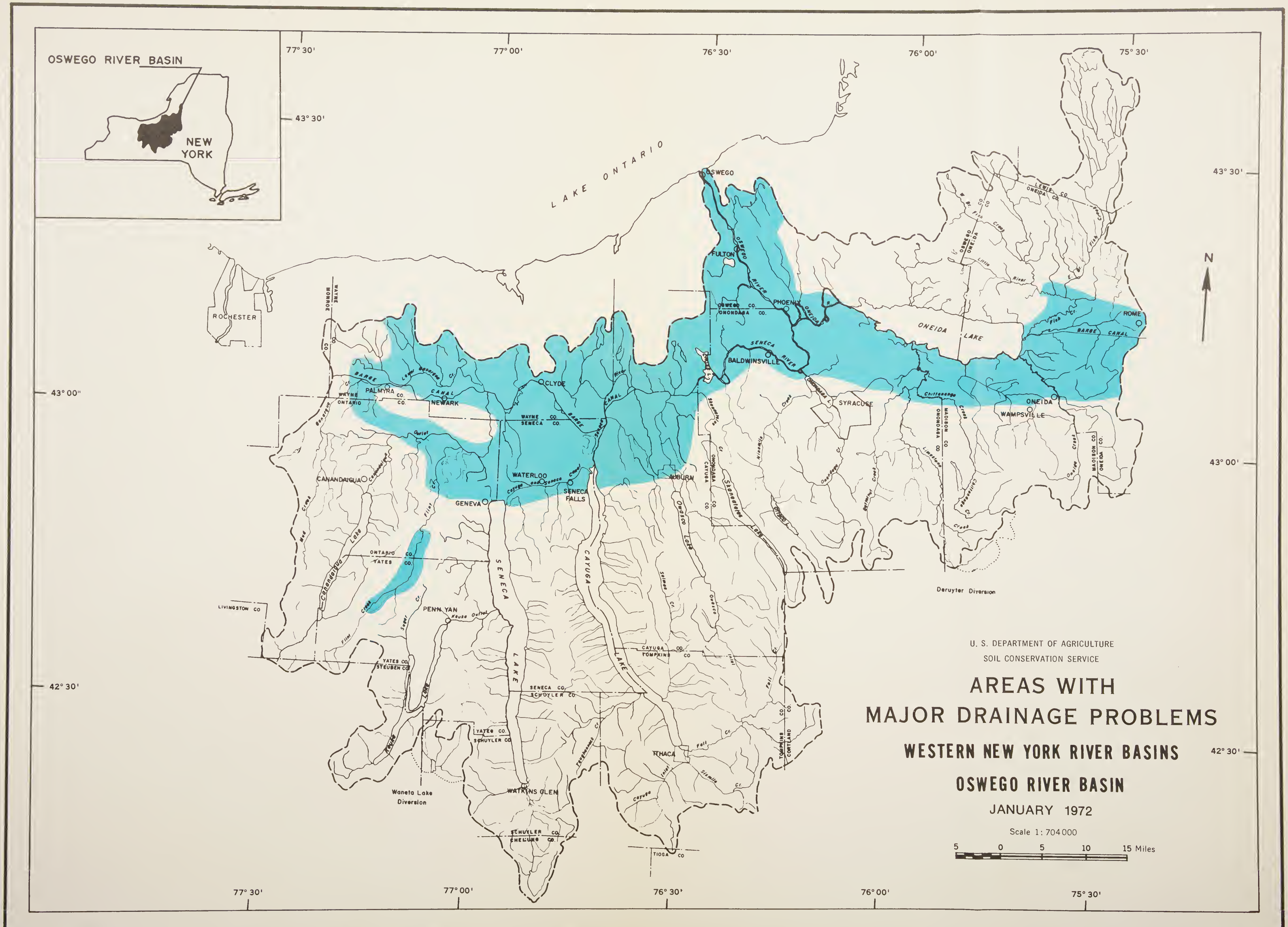
As can be seen from the table, two-thirds of all the acreage irrigated is located in four counties - Onondaga, Oswego, Tompkins, and Wayne.

Crops which will be irrigated are fruits, vegetables, potatoes, and lawn sod. This projected tenfold increase in acres will require great amounts of water. Irrigation water will be increasingly important in yield production and to meet processors demands for improved quality and product uniformity.

AGRICULTURAL DRAINAGE

Not all land in the Oswego River Basin is well drained. Most of the larger areas of poorly drained land are found on the Ontario-Mohawk Plain where the topography is somewhat flatter compared to the Plateau area. However, soil drainage problems are not confined only to the flat lands; they also occur in upland areas where sloping topography removes surface water runoff rather easily. More than 280,000 acres of cropland and pasture have drainage problems. See Figure 5.3 for the location of the major drainage problem areas.

TYPICAL DRAINAGE PROBLEMS



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 5.3

The six areas discussed in the floodwater section also have impaired drainage. Existing channels may be adequate to handle the drainage for the wet soil areas. When runoff water is added from surrounding uplands, the drainage problems become more intense. Mucklands are the most susceptible to this.

A tendency exists to underrate these wet soils. They have a tremendous agricultural potential if managed properly. Potential of muck soils is recognized, yet it is not recognized that many wet mineral soils have a comparable potential. However, some of the Basin farmers recognize this potential because each year they spend $100 - $300 per acre to install needed drainage. They benefit from increased yields, better quality of crops, and more efficient use of farm equipment.

Subsidence, although not an impaired drainage problem, is directly related to the drainage of mucklands. Generally, subsidence tends to be proportional to the depth to the water table and will be accelerated if the water table is lowered. Additional compaction takes place when equipment moves on the muck surface.

In northern Onondaga and southern Oswego counties, impaired drainage is causing extensive problems. The demand for urban development has caused many developers to use marginal land which is often a low-lying wet area. Since natural waterways often are inadequate, the increased runoff from impervious surfaces in urban developments creates problems more frequently and of greater magnitude. Before development, these low-lying wet areas provided flood storage during times of excess flows. Now these areas experience more serious and prolonged drainage problems as well as frequent and higher flood stages. Development of physical facilities and land rights problems sometimes make it exceedingly difficult if not impossible to solve these problems.

WATERSHED PROTECTION AND MANAGEMENT

More intense use of land resources can be expected in the future. These land resources will have to be fully developed and managed if they are to meet the needs, not only of agriculture and forestry, but also the many and varied needs of the whole community. Future management should include many aspects ranging from improved technology to proper use and installation of adapted conservation and development practices.

Proper use and management of these land resources must be recognized as the first consideration of any comprehensive plan for the development of the Basin's water and related land resources.

Land resource problems are soil erosion, excess water, and shallow and droughty soils. These problems occur on 683,730 acres of cropland, 141,560 acres of pasture land, and 797,000 acres of forest land. Figure 5.4 graphically shows the resource problems for each land use.

CROP AND PASTURE LAND

Resource problems on 683,730 acres of cropland are shown by county on Table 5.3. Drainage is the dominant problem on 246,245 acres, erosion on 409,460 acres, and unfavorable soils are a problem on 28,025 acres.

Pasture resource problems occur on 141,560 acres (Table 5.4). Poor cover exists on 105,410 acres, while overgrazing is a problem on 40,750 acres of this pasture land. Cover protection from erosion and excess water is present on 60,270 acres.

FIGURE 5.4 - RESOURCE PROBLEMS IN THE OSWEGO RIVER BASIN, NEW YORK

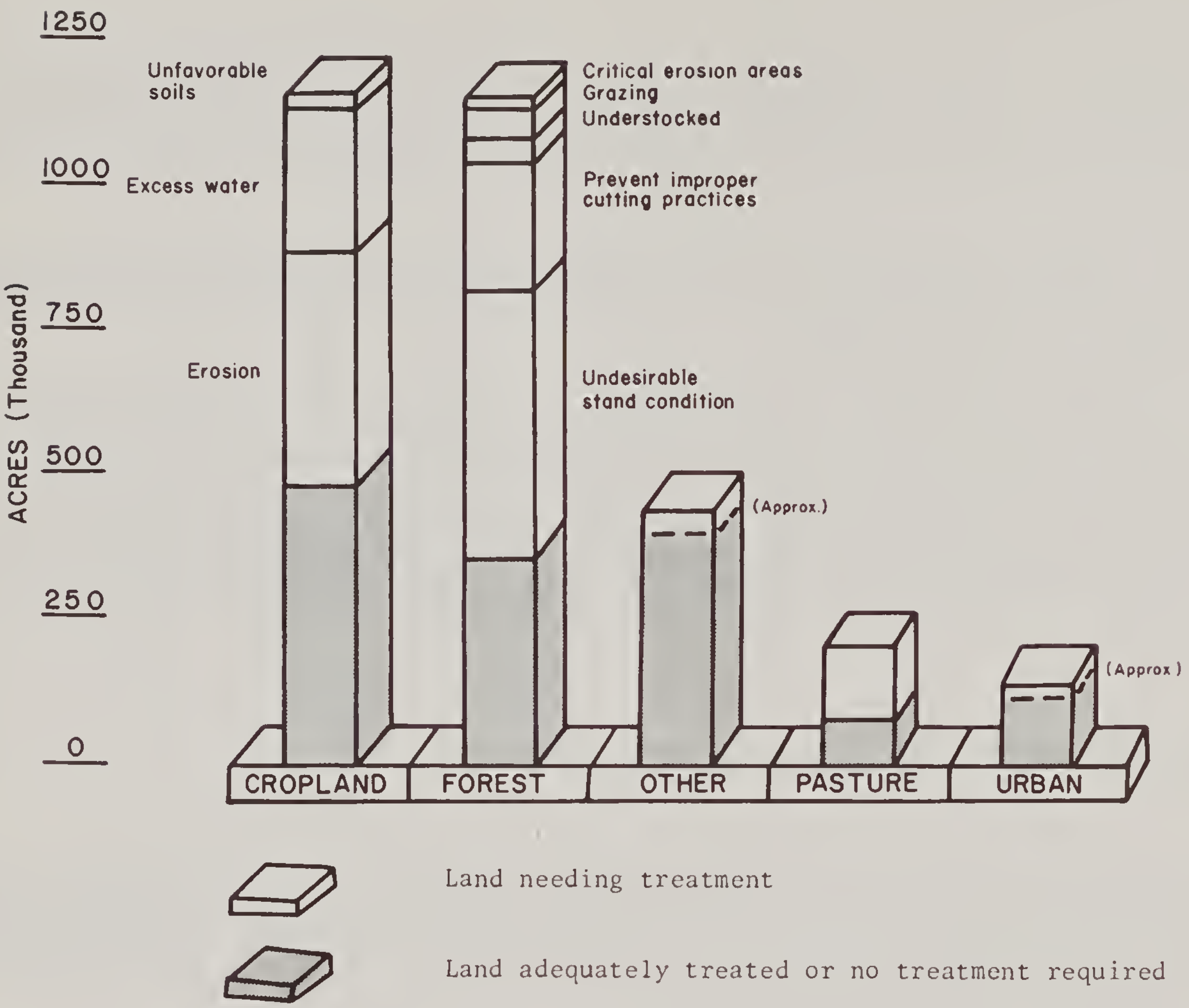


TABLE 5.3-PRESENT AND FUTURE RESOURCE PROBLEMS ON CROPLAND IN THE OSWEGO RIVER BASIN, NEW YORK

County	Erosion	Excess Water	Unfavorable Soils	Total Acres with Problems
Cayuga	117,500	30,000	3,500	151,000
Chemung	870	780	-	1,650
Cortland	5,000	1,000	1,000	7,000
Lewis	830	2,915	460	4,205
Madison	12,300	18,200	1,900	32,400
Monroe	300	200	-	500
Oneida	6,700	25,750	3,900	36,350
Onondaga	44,600	12,900	2,300	59,800
Ontario	62,000	21,600	9,000	92,600
Oswego	6,500	15,000	3,000	24,500
Schuyler	15,860	8,400	65	24,325
Seneca	15,000	60,000	100	75,100
Steuben	4,000	2,000	2,000	8,000
Tompkins	34,000	7,500	200	41,700
Wayne	50,000	20,000	600	70,600
Yates	34,000	20,000	-	54,000
TOTALS	409,460	246,245	28,025	683,730

TABLE 5.4 - PRESENT AND FUTURE RESOURCE PROBLEMS ON PASTURE IN THE OSWEGO RIVER BASIN, NEW YORK

County	Poor Cover	Over-grazing	Erosion and Excess Water	Total Acres
Cayuga	12,000	6,000	500	12,000
Chemung	1,110	900	600	1,300
Cortland	1,000	500	1,000	2,000
Lewis	600	500	70	800
Madison	25,700	500	3,000	25,700
Monroe	100	-	100	100
Oneida	4,000	2,000	20,000	22,000
Onondaga	17,200	2,800	6,500	19,800
Ontario	8,000	1,800	12,960	12,960
Oswego	7,800	4,600	5,600	10,000
Schuyler	4,700	4,000	1,300	7,800
Seneca	1,000	2,000	300	2,000
Steuben	900	150	240	1,000
Tompkins	11,300	14,100	4,100	14,100
Wayne	6,000	400	3,800	6,000
Yates	4,000	500	200	4,000
TOTALS	105,410	40,750	60,270	141,560

NOTE: More than one problem may exist on the same acre of pasture

FOREST LAND

With forest land occupying 1,146,400 acres or 37 percent of the Basin area, proper treatment and management of this resource is important. The principal problems can be related to destructive factors such as fire, improper cutting and logging practices, insect and disease, and livestock grazing. Forest hydrologic survey findings indicate that 90 percent of the forest land is presently in average or better hydrologic condition with the remainder in poor to very poor hydrologic condition. The factors affecting hydrologic condition or the capacity of the soil to absorb and hold water are fire, cutting, logging, and grazing. This survey indicated that 15 percent of the forest area has been subjected to excessive cutting, 12 percent to damaging logging, 5 percent to excessive grazing, and less than 1 percent to damaging fire.

EXCESSIVE GRAZING ON FOREST LANDS

The degree of disturbance was generally slight to moderate, although severe condtitions, resulting from excessive cutting and damaging logging practices were noted in some locations.

As stated in Chapter IV, 91 percent or 1,016,500 acres of the commercial forest land in the Basin is in private, non-industrial ownerships ranging from 15 to 300 acres. This group of landowners is generally not interested in the production of timber or associated activities.

A study[1] indicates that most private landowners use their land for personal recreation and to enhance residential values; then in order of importance, consider the following uses: speculation through resale, timber production, satisfaction of owning land, production of other forest products, wildlife development, and nature study and conservation.

Even when owners are aware of existing forestry programs and are interested in protecting watershed values and timber production, many are discouraged from investing and managing their forest resources for quality water and timber. Capital to improve forest conditions as long-term investment is either not available or is invested in other opportunities for a quicker return. They often have more alternative investments available or they have an immediate need for increased income. This creates a tendency for many individuals to harvest timber products as soon as they are of merchantable size rather than keeping them until they reach their maximum economic growth.

Installation of forest improvement work is hindered by the attitudes of many small private forest landowners. The attitudes and interests of these landowners will determine to what extent the Basin's forests can supply the future demands of forest industries, recreation, and fish and wildlife, along with maintaining and improving the desirable hydrologic condition.

In 1969, over 57,000 acres of forest land were used for grazing livestock. Woodland grazing compacts the soil, damages and destroys vegetative cover and tree roots, and reduces litter and humus volumes.

Growth of natural reproduction and planted stock is retarded and trees eventually dies. Under such conditions the forest hydrologic conditions rapidly deteriorate and the water holding and infiltration capacity of the soil is greatly reduced.

There are presently approximately 11,000 acres of forest land that are producing below their potential due to inadequate stocking. An additional 469,000 acres contain timber of a quality that is too low to sustain profitable, stable forest-based industries. This condition is due largely to past cuttings after which, with few exceptions, little or nothing was done to insure the success and/or improvement of the next crop.

The lack of broad public concern, low profit margins, objectives other than timber production, or lack of knowledge among private non-industrial forest landowners all contributed to the resulting low-quality timber on nearly half of the Basin's commercial forest land. Markets for little-used species, low quality and small size trees are lacking in most areas. Landowners are not able to sell low quality material, which would increase the quality of their timber stands.

EROSION AND SEDIMENT DAMAGE

Erosion produces sediment which becomes a problem when its occurrence conflicts with the interests and activities of man. Rates at which soils erode depends upon several factors, some of which are: amount and intensity of precipitation, temperature, wind velocity, soil type, and length and steepness of slope, land use, vegetal cover, past and present management, and the conservation practices installed. In the Oswego River Basin, both water and wind erosion occur and to keep erosion and resulting sediment to a minimum, it is important to control as many of the above factors as possible.

Map studies and field surveys were made to assess the amounts and kinds of erosion and sedimentation occurring within the Basin. Estimates were made as to the rates of sheet erosion, gullying, and streambank erosion.

EROSION DAMAGE

There are a few local areas in the Basin where sheet erosion is severe and has progressed to the stage of gullies. Due to the large Basin area, significant amounts of sediment are contributed by streams. This sediment is deposited mainly in the flood plains and to a lesser degree in stream channels, lakes, and behind hedge, and fence rows.

1/ Survey of Forest Owner Characteristics and Attitudes in Berkshire County, Massachusetts, 1963

EROSION DAMAGE ON UNPROTECTED LAND

Erosion of existing roads and skid trails and the proper location of future roads and trails is a problem on forest land. Control of existing erosion is hindered by high installation costs and limited cost-sharing funds. Past accomplishments have met only 10 percent of the needs.

Problems caused by urban expansion and development are increasing annually as more and larger areas are being disturbed for construction resulting in erosion. More attention should be given to reducing or eliminating soil losses which occur during urban development.

SHEET EROSION

Sheet erosion in the Basin is very common and occurs to some degree throughout the area. Soil survey maps show that almost all sheet erosion is moderate in degree. A few small local areas are designated as severe.

One of the main factors governing the amount of sheet erosion which occurs is land use. Erosion is more severe where intensive cropping patterns are improperly used, cover conditions are poor, or soil is undergoing extensive disturbance during a change in use such as urban development.

The erosion hazard is greatest where the topography is steepest. Serious hazard areas have a combination of easily erodible lake-laid soils, uniform-sized, silty glacial till soils, and steep slopes.

In most of the Basin, soil loss from sheet erosion on agricultural land is within the allowable 3 tons per acre per year considered acceptable for sustained agricultural production. On open land, soil loss figures show a range of 1.2 tons to 4.2 tons per acre per year. Good cover exists and long rotations are being used in most cases.

However, several local areas such as around southeastern Ontario County and northeast Yates County show excessive losses. Losses as high as 10 tons per acre per year in rotations in support of dairying, and as much as 40-50 tons per acre per year occur in some vegetable rotations.

Forest hydrologic survey findings indicate that erosion is not a major problem. Soil loss from forest land resulting from sheet erosion is less than 1 ton per acre which is near the geologic norm over most of the forested area. This is due to the generally good forest cover which exists in the Basin. However, there are some localized erosion problems.

GULLY EROSION

Erosion, when uncontrolled, progresses through stages of rill erosion into gully erosion. There are very few areas of active gully erosion. Most are isolated road cuts which are not properly seeded or overtilled cropland in the steeper areas of the Basin such as on drumlins and in the plateau areas.

Logging roads and skid trails are the greatest single cause of accelerated erosion in forested areas. Based on expansion of the 1957 New York Conservation Needs Inventory, it is estimated that about 200 miles of eroding logging roads and skid trails exist in the Basin. Estimates of annual amounts of soil reaching stream channels from poorly constructed and maintained logging roads and skid trails can be as high as 80 tons per mile of road. Erosion and soil loss from properly located logging roads and skid trails are negligible.

EROSION OCCURRING ON A POORLY LOCATED LOGGING ROAD

STREAM BANK AND FLOOD PLAIN EROSION

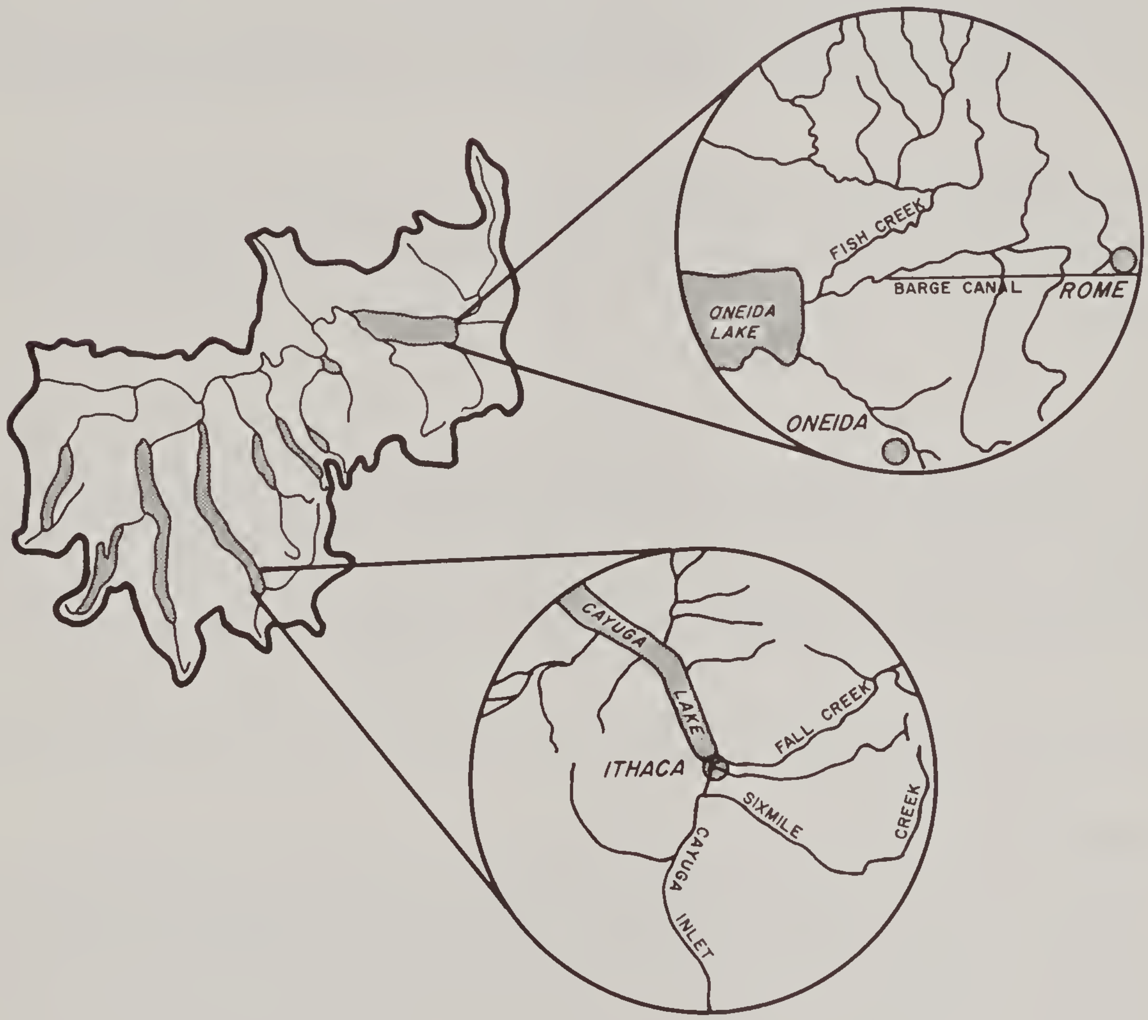
Streambank erosion and flood plain erosion is generally minor in the Basin. Localized occurrences of severe erosion were noted in several areas, but these are not extensive. Banks generally are low and have fair vegetation of grasses, weeds, and trees.

STREAMBANK EROSION

A report *National Assessment of Streambank Erosion* by the Army Corps of Engineers compiled in May 1969, indicated minor problems in the Oswego area. Total channel length in the Basin is over 5,200 miles and of this only 51 bank miles (1 percent) has moderate erosion and 51 bank miles has serious erosion. Moderate erosion is that which is localized with control measures jistified on an individual or small group basis. Serious erosion is of the extent and severity that indicates a need for, and apparent feasibility of project type control measures. No effort was made to pinpoint specific locations since the land damaged is of low value and estimated costs of treatment are excessive.

Probably the most significant occurrence of serious streambank erosion is along the lower reaches of Fish Creek in Oneida County. Averaging 12 feet in height and 300 feet in length, these banks are eroding at a rate of about 0.5 feet per year. Some raw banks are over 75 feet high in this area.

FIGURE 5.5 - MAJOR STREAMBANK EROSION PROBLEM AREAS IN THE OSWEGO RIVER BASIN, NEW YORK



Cayuga Inlet in southern Tompkins County has some raw banks more than 25 feet high which are contributing to the sediment problems. In these cases, the stream is cutting into a steep slope. Although lateral movement is not great, large amounts of sediment are produced.

The most significant erosion damage to agricultural land is the loss of fertile alluvium when streams cut new channels. In most areas, these alluvial soils are replaced by infertile, cobbly riverwash which cannot be cultivated. On the flood plains of Fish and Wood Creeks in Oneida County new channels are cut and the old channels develop into swampy oxbows. Old and new channels dissecting the flood plain create small, irregular-shaped fields which farmers find difficult to work with modern machinery.

WIND EROSION

Erosion of this type is found to be a problem on the intensely farmed mucklands such as found along Flint Creek in Ontario and Yates Counties, along the Seneca River in Seneca County, at Port Byron in Cayuga County, and in small acreages in Oswego, Onondaga, and Oneida Counties. Flat topography, light soil weight, and dry conditions all contribute toward wind erosion. Wind erosion removes quantities of the light dry muck from the damage area and deposits it in ditches and on nearby uplands. Seed is often lost and young seedlings are damaged by the cutting effect of these wind-carried particles.

URBAN DEVELOPMENT EROSION

Urbanization in the Basin is occurring rapidly in the major areas of population concentration particularly in Syracuse, Auburn, Ithaca, and Rome and also in the resort areas of Canandaigua, Geneva, and Watkins Glen. Many people are affected by these small areas which are undergoing development. Uncontrolled erosion and sediment from these areas causes severe economic damage to individuals and society in general. Stream pollution and damage to public facilities and private homes are among many examples.

Excessive soil losses are recorded whenever urban development takes place. Large areas are often exposed to forces of nature resulting in excessive erosion and runoff. The eroded material is then carried into drainage ditches, sewers, and streams causing the loss of capacity of these conveyances.

During urban construction, land is often denuded for two or more years during construction and during this time erosion rates can range from 3 to more than 100 tons per acre per year.2/ As the demand for land for urban construction grows, less desirable land is used. Oftentimes this means construction on steeper slopes which in turn means increased rates of erosion.

ROADSIDE EROSION

Roadside erosion, while not a major sediment contributor, is costly in those areas where it does occur. On a per acre basis, roadside erosion is the highest contributor of sediment. This type of erosion is most prevalent in the numerous road and highway cuts through rolling sections of the Basin. Steep slopes, poor vegetative cover, and easily erodible soils combine with rainfall to produce large amounts of sediment. Sediment from this erosion fills roadside ditches, impeded drainage and reduces culvert capacity. This necessitates periodic cleanout by highway crews.

Steep, poorly vegetated slopes in unstable, lacustrine soils are the causes of mudflows following heavy rainfall, again necessitating costly sediment removal and closing of roads.

Too often the highway maintenance program includes the cleanout of ditches where good cover has been established. Erosion occurs on the cut slopes when topsoil is not replaced and good cover cannot be easily established.

SEDIMENT DAMAGE

Sediment is deposited on the flood plains during high flows. Resulting accumulations of silts and sands may be only a fraction of an inch. Damage to agricultural land is slight, but when this accumulation occurs in homes and business establishments, it is costly to remove. Suspended sediments significantly reduce stream quality for municipal and industrial water supply, for swimming, and often destroys fishery habitat.

Larger particles of infertile overwash are deposited on lands where steep gradient streams emerge from higher areas of the Allegheny Plateau.

Excessive erosion from all sources increases sedimentation rates in reservoirs and lakes. This has reduced the recreation and fishing values in Oneida Lake and Lake Neathawanta at Fulton and has contributed to the need for dredging the Barge Canal channel through and east of Oneida Lake. Local occurrences of stream channel deposition can be seen in sand and gravel bars which develop in the smaller streams.

2/ Wolman, M. Gordon, *Problems Posed by Sediment Derived from Construction Activities in Maryland,* 1964, p. 6.

POLLUTION

Water quality problems exist in many areas of the Basin. Raw or inadequately treated wastes discharged by industries, municipalities, and individual residences are the principal sources of pollution. The former source contributes about 40 percent of the problem while municipalities cause more than 50 percent. 3/ In addition, pesticides and fertilizers have taken on a new importance in the area of pollution. Use of these two items has caused increasing concern among many people in the Basin.

SOURCES

SEWAGE

Untreated or poorly treated sewage is being discharged into streams throughout the Basin. Polluters range from local communities to the large industrial plants and include even the pleasure boats, and individual residences. Sewage accelerates plant growth and causes obnoxious odors and unsightly conditions in addition to the health hazard.

PESTICIDES

Pesticides are needed for the economic production of food and fiber. The use of these chemical tools has made a tremendous contribution to man's health and welfare over the past 25 years.

Their use presents a potential for contamination of the environment. Unfortunately, in some instances they have been abused and misused without due consideration to their impact on other organisms.

FERTILIZERS

Pollution from fertilizers is not thought to be a problem of great magnitude, but is great enough to cause concern. Fertilizers contribute to stream pollution by adding nutrients to surface waters by runoff, erosion, and percolation. Nitrogen and phosphorous compounds are of major concern. When present in streams they contribute to the growth of various algae forms and accelerate growth of phreatophytes. Algae can be a nuisance by contributing foul odors and taste to the water, depleting the dissolved oxygen supply, and clogging waterways.

LOCATIONS 4/

There are numerous areas of water quality problems in the Basin as shown on Figure 5.6. The major problem areas are the Syracuse-Onondaga Lake Area, the outlets of the Finger Lakes, the Oswego River below Fulton, the Seneca River in the Waterloo-Seneca Falls area, and the Barge Canal below Newark. Common pollutants which are causing the problems include solids, food processing waste, chemicals, oils, and dyes.

Oververtilization is a problem in most of the major lakes in the Basin. Aquatic weeds are especially abundant in Oneida Lake, the northern end of Seneca Lake and the northern and southern ends of Cayuga Lake.

Syracuse-Onondaga Lake Area

This lake is located in the Syracuse metropolitan area and is subject to intense pressure from both municipal and industrial discharges. Untreated sewage flows into the lake after overflows from the city's sewers occur during storm periods. Inorganic and organic sediments are being discharged by the chemical and steel plants located along the lake and the main tribu-

---

3/ Data obtained from New York State Department of Environmental Conservation

4/ *Water Pollution Problems and Improvement Needs - Lake Ontario and St. Lawrence River Basins,* U. S. Department of Interior and New York State Department of Health, 1968

taries flowing into the lake. Poor circulation in the lake also contributes to the problem.

Finger Lake Outlets

Skaneateles and Owasco Outlets are probably the most seriously affected of the Finger Lake Outlets. The lakes are regulated in order to provide water for Syracuse and Auburn respectively. The resulting low flows do not dilute the domestic and industrial wastes sufficiently and this results in a creamy-colored, foul odor from the creeks.

Canandaigua Lake Outlet has experienced numerous fish kills because of pollution from chemicals and food processing wastes which are discharged into the stream.

Keuka Lake Outlet occasionally experiences the same problems.

Seneca River, Seneca Falls - Waterloo Area

This area of the river is extremely polluted and fish kills have often been reported in this area. The principal pollutant is untreated industrial wastes from several plants and the partially treated wastes from the village of Seneca Falls and Waterloo. The overloading of the treatment plants occurs almost every summer and fall when the canning plants are in full operation.

Oswego River below Fulton

Raw waste from this intensely industrialized area is dumped into the river severely polluting this reach. Fulton and Oswego are discharging poorly treated waste into this watercourse.

Pollution is prevalent in many other localized areas of the Basin. Many of these are seasonal and of a minor nature. However, they contribute to the deterioration of the streams and must be eliminated.

EFFECTS

In addition to killing fish, wildlife, and other living organisms and the extreme hazard to humans, water pollution also detracts from the natural scenic beauty and limits recreational use. In several locations, recreational facilities were abandoned because of water pollution. Not only does pollution limit the recreational use of water, it also reduces the value of waterfront and adjacent property.

WATER QUALITY CONTROL

There is a great need to reduce the ever-increasing pollution problem which diminishes the quality of surface waters for consumptive uses, recreation, fishing, and aesthetic values.

There is a need to keep pesticide users informed as to the importance of following manufacturer's recommendations so that the chance of damaging effects are eliminated.

With modern methods of placement of fertilizers on agricultural lands, almost all of the fertilizers can be used by the crop and losses to streams is minimal. This loss can be kept at a minimum by continuing to educate users as to the possible harmful effects of fertilizers and crop production benefits derived from proper fertilizer placement.

The farmers of the Basin are not fully using conservation practices to control sheet erosion. Erosion of this type with attendant fertilizer pollution of runoff is aggravated by the trend to more intensive corn growing on sloping cropland.

WATER SUPPLY

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

At the present time, only the city of Ithaca has a shortage of water. In order to satisfy peak demands, an additional 1.4 million gallons per day (mgd) are needed.

Anticipated municipal needs for the entire Basin are expected to increase to 29 mgd by 1990 and to 312 mgd by 2020. Industrial users who are not tied in with a municipal system will also require more water.

Twenty-nine municipalities will require additional supplies to meet their needs by 2020. Those areas which will have major problems include the northern end of Canandaigua Lake, the area around Oneida and Chittenango and the Ithaca urban area.

Further problems will result if any of the present sources of water become polluted in any way and cannot be used. Water needs for the specific villages and cities are shown in Table 5.5 and their locations on Figure 5.6.

TABLE 5.5 - MUNICIPAL WATER SUPPLY NEEDS FOR 2020, OSWEGO RIVER BASIN, NEW YORK

		Amount of Water Required	
County	City or Village	MGD	CFS
Cayuga	Auburn	8.01	12.39
	Brutus	1.18	1.82
	Owasco	2.74	4.24
Madison	Cazenovia	2.23	3.45
	Lenox	6.07	9.39
	Oneida	7.94	12.28
	Sullivan	10.60	16.40
Oneida	Camden	1.12	1.73
	Verona	2.78	4.30
Onondaga	Baldwinsville	6.95	10.75
	Lafayette	2.63	4.07
	OCWA	152.20	235.45
Ontario	Canandaigua	4.44	6.87
	Geneva	4.22	6.53
	Manchester	0.22	0.34
Oswego	Fulton	4.25	6.58
	Hastings	2.50	3.87
	Phoenix	2.44	3.78
Seneca	Seneca Falls	2.94	4.55
	Waterloo	3.03	4.69
Tompkins	Dryden	5.68	8.79
	Ithaca	27.25	42.16
	Trumansburg	0.61	0.94
Wayne	Lyons	0.27	0.42
	Macedon	4.19	6.48
	Newark	3.93	6.08
	Palmyra	2.24	3.46
Yates	Dundee	0.86	1.33
	Penn Yan	3.16	4.89
BASIN TOTAL		276.68	428.03

Water requirements for forest products vary by the product and the process used in its manufacture. Limited quantities of water are used in the production of lumber and wood products.

The water needs for pulp and paper mills are shown in Table 5.6. The quantity of water needed for pulp and paper processing and residue disposal varies with the pulping process used, and whether paper manufacture is integrated in the process. Water requirements for pulp and paper making processes should decrease somewhat in the future. Most water used in processing may be recirculated in the mill, but finally return to the stream in the effluent either directly from the mill's own treatment plant or through municipal treatment plants.

TABLE 5.6 - WATER NEEDS FOR PULP AND PAPER MILLS IN THE OSWEGO RIVER BASIN, NEW YORK

Type of Plant	Number of Plants	Annual Gallons of Water 1/ (In Millions of Gallons)
Paper Mills	9	1,451
Pulp Mills	1	68

1/ Represents all mills running at full capacity

RURAL DOMESTIC AND LIVESTOCK WATER SUPPLY

The major source of supply to meet the present water demands of the on-farm, and rural non-farm, domestic consumers is ground water. A review of the agricultural water use picture for the Oswego River Basin indicates the supply is in line with demand. Only one area might be classified as a chronic deficit area.

The area that experiences chronic shortages is in the southern Cayuga County. This problem was particularly acute in the mid 60's as wells went dry early in the summer and large quantities of water were hauled from various sources to many farms and homes in the area. Field investigations revealed that the problem is not geographically localized but interspersed randomly over the area. It is not uncommon for one man to have an excellent well while a neighbor must purchase water to meet even household needs. This area is a prime agricultural area and a water supply problem could hamper future development, particularly of dairying.

Water for livestock is not readily available in pastures. Often cows need to go back to the barn or are locked in the pastures unable to get to any watering source. Milk production from these thirsty cows is reduced.

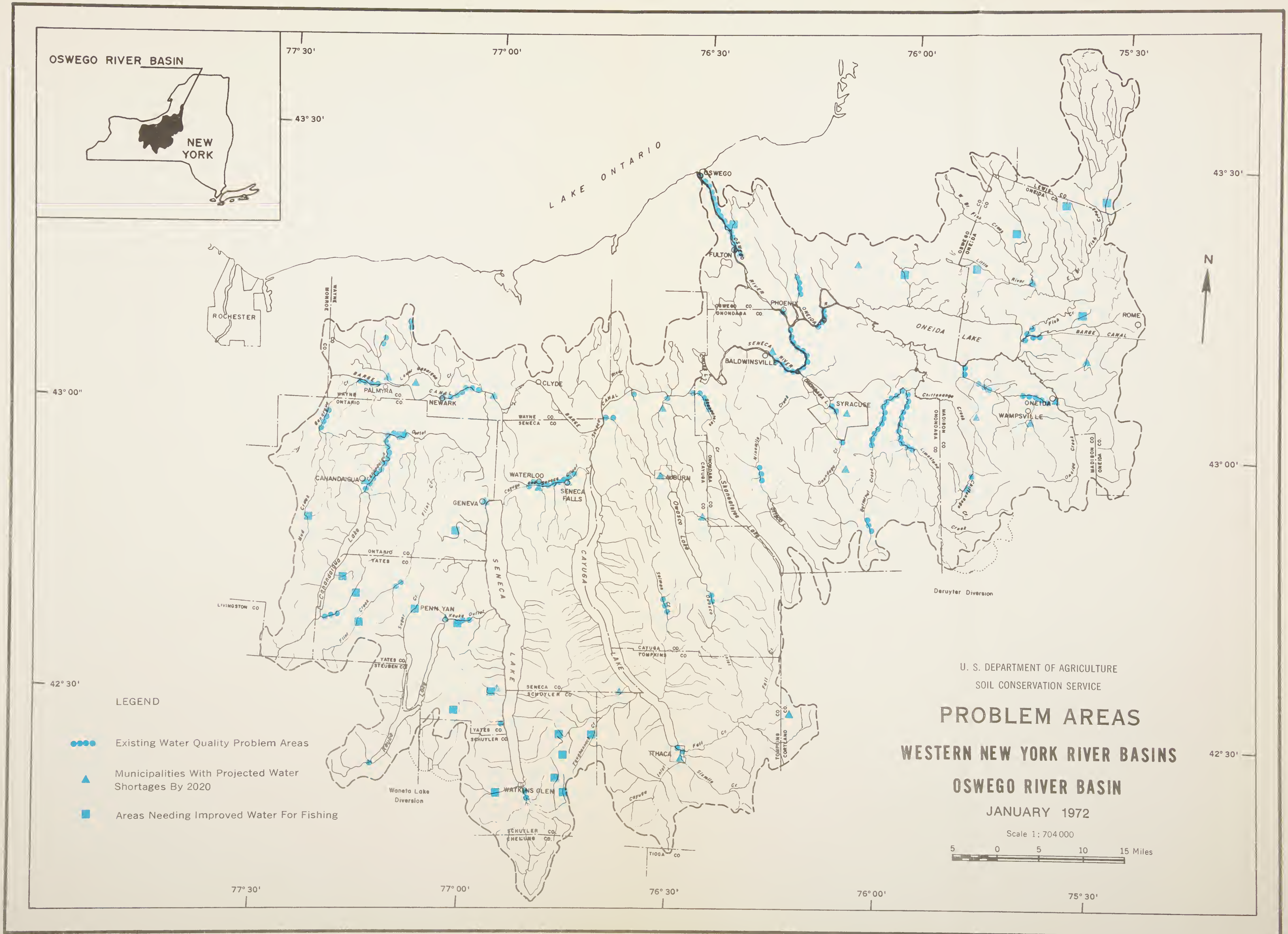
RECREATION

A major problem is the lack of accessibility to many public waters. The vast majority of land surrounding the major bodies of water are in private ownership. Increased posting against trespass has restricted, or precludes, the use of many waters and related lands. Use is restricted further by the lack of adequate numbers of access facilities to public waters. This lack of accessibility is because of insufficient public ownership of land adjacent to recreational waters.

Certain bodies of water are severely limited for recreational use by pollution. Low stream flow during the summer months restricts many recreational activities.

Recreational water is insufficient for the development of water-oriented recreational facilities. There is also a problem of limited land or facilities now available for non-water oriented recreation. Land and facilities are lacking both in the rural and urban areas throughout the Basin.

Twelve boat access sites are needed on the Barge Canal, rivers and larger warm-water streams. In addition, 17 boat launch areas are needed on the Finger Lakes and Oneida Lake and 21 on the smaller lakes and large ponds.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 5.6

At the present time, there are only about 10,000 acres of developed recreational areas in the Basin. According to a report by the Bureau of Outdoor Recreation 5/ this leaves a deficit acreage of about 33,000 acres needed for boating, camping, swimming, and fishing. Future requirements for developed recreational areas are:

Year	Acreage
Present	33,000
2000	50,000
2020	70,000

Within the Hector Land Use Area, administered by the U. S. Forest Service, there is a need for additional impoundments and land acquisition for consolidation if the area is to meet present and future demands for public use. Projected needs for impoundments are shown under water supply and demands (Hector Land Use) in Appendix D.

A land classification study of the Hector area indicates that an additional 7,000 acres of intermingled and adjacent private lands should be acquired to make an adequate administrative unit which would provide a land base for development of the recreation resources. Undeveloped land is becoming more and more scarce and prices are rising. The intermingled private lands within the general ownership boundaries of the Hector area restricts effective development. Since there is no enabling legislation in New York for purchase under the Weeks Law, the Forest Service cannot presently consolidate holdings.

FISH AND WILDLIFE

FISH

There are a number of problems associated with our streams and lakes that impair their production of fish. Abatement of municipal and industrial pollution would improve water quality on 90 miles of warm-water streams and rivers and 80 miles of cold-water trout streams. In addition, there must be a reduction in the amount of nutrients entering the lakes and proper use of the chlorinated hydro-carbon pesticides particularly DDT.

Greater stream flow during the summer would improve 42 streams. Streambank protection and fisheries habitat improvement are needed on 355 miles of trout streams. Lake shore lines need to be protected from dredging and filling to protect spawning, feeding, and fishing grounds and preserve the natural scenic beauty.

Access is needed on 83 trout streams or section of streams involving 459 miles of trout water. Fishing facilities are needed on the larger lakes in addition to more access to waterfront property by the public.

WILDLIFE

There are some 15 valuable wetland areas (about 21,500 acres) that need to be preserved for waterfowl utilization. Many of these areas are associated with the Barge Canal. There is a need for abatement of oil and pesticide pollution to benefit wildlife.

5/ *Water Oriented Outdoor Recreation in the Lake Ontario Basin 1967*

CHAPTER VI

EXISTING WATER AND RELATED LAND RESOURCE PROJECT AND PROGRAMS

Public agencies carry out a number of water and related land resource programs in the Basin. Many of these programs are carried out cooperatively between federal, state,and local agencies. Specific activities pertinent to water and related land resource development are described in this section.

FEDERAL PROGRAMS

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE PROGRAMS

The Agricultural Stabilization and Conservation Service administers several United States Department of Agriculture programs in the Basin area. One of these, the Rural Environmental Assistance Program (REAP) provides cost sharing assistance to farmers and other forest landowners who undertake soil, water, forest, and wildlife conservation practices on farmlands currently in agricultural production. The cost for such practices is shared between the federal government and the farmer.

Technical assistance for REAP practices is rendered by the Soil Conservation Service, Extension Service, and the U. S. Forest Service in cooperation with the New York State Department of Environmental Conservation, Division of Lands and Forests.

The REAP can serve as a valuable tool to help solve the erosion and sediment problems in the Basin through the establishment of conservation practices.

COOPERATIVE EXTENSION SERVICE PROGRAMS

This agency provides educational programs in several broad areas; two of these being the agricultural and forestry production and marketing program, and the community resource development program.

The agricultural and forestry production and marketing program provides technical assistance to individuals and firms in utilizing new technology resulting from research. The community resource development program provides educational, organizational, and technical assistance to communities in developing their resources.

The 4-H Youth Development Program is also administered by this agency which provides guidance and development for youth in several areas.

Through these programs individuals in the Basin can obtain current information and assistance to aid in solving land water resource problems.

FARMERS HOME ADMINISTRATION PROGRAMS

This U. S. Department of Agriculture agency administers programs available to individuals and groups in the Basin. The following is a list of these programs:

- Emergency loans
- Farm ownership loans
- Financial assistance to small towns and rural groups
- Loans and grants for farm labor housing
- Loans for forestry purposes
- Loans for recreational purposes
- Loans to rural families with small incomes
- Operating loans
- Rental housing
- Rural housing loans
- Rural renewal loans

Of particular importance in the Basin are farm ownership loans, watershed loans under PL-566, financial assistance to small towns and rural groups, and loans for recreational purposes. Farm ownership loans are used for a variety of purposes, including providing basic soil treatment and land conservation measures as well as providing necessary water and water facilities.

Another program of significance in the Basin provides financial assistance to small towns and rural groups, makes loans and grants to public and nonprofit organizations primarily serving rural areas to plan and develop domestic water supply and waste disposal systems. The loans for recreational purposes program provides funds to operators or managers of family farms for the purpose of developing land and water resources; repair and construction of buildings; purchase land, equipment, and related recreational items; and pay necessary operating expenses.

These programs can assist financially in solving major problems of sediment and erosion control, as well as providing municipal water, waste disposal systems, and recreational facilities.

FOREST SERVICE PROGRAMS

COOPERATIVE STATE-FEDERAL FORESTRY PROGRAMS

The New York State Department of Environmental Conservation, Division of Lands and Forests and the U. S. Forest Service have been partners in the protection and management of forested watershed lands in the Basin for many years.

Cooperative Forest Fire Control

Professional and financial assistance for fire protection is provided to the state for non-federal forest land. The state administers the protection program and is reimbursed from Federal funds up to 50 percent of expenditures. Federal participation includes services such as assisting in training personnel, development and procurement of better fire equipment and tools, radio development and use, preparation of fire plans, assisting in application of new developments in forest fire research, and direction of the nationwide forest fire prevention program. Continued forest fire protection will be needed on the 1,146,400 acres of forest land to maintain and improve forest hydrologic conditions and to assure continued improvement of forest resources.

FOREST MANAGEMENT (COOPERATIVE FOREST MANAGEMENT ACT OF 1950)

The state is provided financial and professional assistance to assist private forest landowners in practicing multiple-use forest management. The Cooperative Forest Management Program is administered by the state and reimbursed from federal funds on a cost-sharing basis. The private forest landowners are provided on-the-ground technical assistance by professional foresters employed by the state. Forest land treatment accomplishments under the Cooperative Forest Management Program totaled 96,000 acres for the 10-year period 1958-1967 (Table 6.1).

The state also receives financial and professional assistance for providing technical assistance to sawmill operators and other processors of forest products for improved logging, processing, and manufacturing techniques, marketing information, and safety.

Forest landowners may qualify for federal cost-sharing through the Rural Environmental Assistance Program for approved practices.

TABLE 6.1 - FOREST LAND TREATMENT NEEDS AND ACCOMPLISHMENTS UNDER GOING PROGRAMS ON PRIVATE FOREST LAND WITH PROJECT ACCOMPLISHMENTS 1/ TO 1980, 2000, and 2020, OSWEGO RIVER BASIN, NEW YORK

	No. of Plans	Forest Mgmt. Plans	Supervised Harvest	Timber Stand Improvement	Planting and Seeding	Protection from Grazing	Erosion Control	Total
			(thousands of acres)					
Accomplishments - 1958-1967	1,000	36	12	9	36	2	1	96
Present Needs - 1968	10,000	955	223	469	41	57	7	1,752
Projected Accomplishments through 1980	1,000	88	19	16	11	1	2	137
Projected Accomplishments through 2000	2,000	233	51	42	29	3	7	365
Projected Accomplishments through 2020	4,000	380	83	68	all	5	all	584
Remaining to be done	6,000	575	140	401	-	52	-	1,168

1/ Forest Hydrologic Survey, *Conservation Needs Inventory*, and District Forester's interviews.

FOREST RESEARCH

The Northeastern Forest Experiment Station, a branch of the U. S. Forest Service, presently operates research projects at the State University College of Forestry at Syracuse University. The objectives of this research are to (1) determine the influence of climatic, soil, and other environmental factors on hydrologic processes in relationship to forest types and conditions in New York State; (2) to describe the structure of private forest recreation markets; (3) to measure the economic performance of private forest recreation markets; (4) to provide private forest landowners guidelines for developing the types of recreation services that will meet the growing popular demand; (5) to stimulate, encourage, and assist graduate students and faculty members, at universities and colleges throughout the northeast, in the biological, social-psychological, mensurational, economic, and multiple-use aspects of forest recreation research; and to conduct research on the underlying structures and basic relationships which may exist in outdoor recreation demand.

HECTOR LAND USE AREA

As on all land administered by the Forest Service of the U. S. Department of Agriculture, the Hector Land Use Area is dedicated to the principle of multiple-use management of the nation's forest resoruces for sustained yields of wood, water, forage, wildlife, and recreation. Accomplishments since 1961 have resulted in the following: 5,000 acres in 39 fenced pastures; 500 acres of timber stand improvement; 340 acres in 32 developed wildlife units; 19 shallow water impoundments; a recreation site with 12 family units; a trail shelter (10 people capacity); 14 miles of hiking trails. For more detail see Appendix D.

SOIL CONSERVATION SERVICE PROGRAMS

PUBLIC LAW-46

This law established the Soil Conservation Service (SCS) in April 1935, and made SCS responsi-

ble for developing and carrying out a national program of conservation and development of land and water resources.

The Service has an objective of an integrated system of land use and conservation treatment in harmony with the capability and needs of the land. To accomplish this, SCS employs scientists and technologists from every discipline that can help to diagnose land problems and prescribe successful treatment alternatives and uses.

Most of the on-the-land SCS assistance to landowners is channeled through the soil and water conservation districts.

Following are some of the conservation programs and practices for which SCS has offered technical assistance:

- Contour farming
- Cover and green manure crops
- Crop residues
- Diversions
- Grass waterways
- Ditch bank seeding
- Critical area planning
- Streambank protection
- Stripcropping
- Terraces
- Bedding
- Open ditches
- Land grading
- Tile drains
- Conservation planning
- Soil survey
- Soil survey interpretations
- Upland wildlife habitat management
- Wetland wildlife habitat management
- Recreational area improvement

Most of these measures are used to solve erosion, sediment, and drainage problems which result in increased agricultural yields and reduction in crop damage.

There are still many areas having these problems and additional work on employing more conservation practices must be taken in the future.

CONTOUR STRIP CROPPING

PUBLIC LAW 566 PROJECTS

Under this law, technical and financial assistance to state and local organizations is provided for planning, designing, and installing watershed improvement works. Cost-sharing is provided for flood prevention, irrigation, drainage, sedimentation control, fish and wildlife developments, and public recreation. Long term credit can be obtained by local interests for their share of the costs.

Cowaselon Creek in Madison County is the only completed PL-566 project found in the Basin. All work which was desired by the local people was completed as of July 1, 1970. At the present time, three watersheds are in some phase of planning process. The Flint Creek work plan is

prepared and is awaiting action by the sponsoring organization. Applications for assistance have been received for the Rome Muck watershed in Oneida County and the Higinbotham Brook watershed in Madison County.

Several watersheds examined as part of this study have possible potential as PL-566 projects. They are summarized and the results given in the section of this report entitled *Opportunities for Development and Impact of USDA Programs and are more fully described in Appendix B.*

The responsibility for soil and water conservation applicable to lands used for forestry purposes and the forestry phase of the PL-566 program lies with the U.S. Forest Service. This includes the planning and installation of forest land treatment measures on privately-owned land. These measures are essential to bring about the greatest reduction in flood, erosion, and sediment damages by improving forest hydrologic conditions and achieving soil and water conservation of forest lands.

The Forest Service provides financial and professional assistance to the State. The State furnishes the on-the-ground technical assistance to the private landowner on a cost-sharing basis with the U.S. Forest Service. Through this program, watershed protection and flood prevention problems can be solved which cannot be adequately met by other going programs. Close cooperation is required between federal agencies, state agencies, and local organizations in developing and carrying out watershed work plans.

RESOURCE CONSERVATION AND DEVELOPMENT PROJECTS

The extreme southeastern part of the Basin (Madison and Cortland counties) is within the South Central New York Resource Conservation and Development Project Area. The project plan has been published and more than 200 project measures have been proposed. Of these, at least 16 measures are within the Oswego River Basin.

Five of these project measures in the Basin are directed toward solving recreation problems and the remaining 11 measures are divided among a number of other uses. The recreation measures will assist in meeting some of the recreation needs previously described in this report.

Recently enacted legislative changes will bring about cost-sharing for some recreation developments in the RC&D area. Thus, the RC&D program will be able to provide some assistance in financing the recreation sites proposed in the early action program for the Basin. The program is flexible enough so that as knowledge and understanding develops it can be adapted for the implementation of additional measures.

The Soil Conservation Service has USDA leadership in this program. Assistance is provided where acceleration of going programs of resource conservation, development, and utilization will increase economic opportunities for local people. Technical and financial assistance is available as well as loans on a limited basis. Technical help is available for a wide variety of problems including flood, sediment, and erosion problems as well as advise on ground cover, tree and shrub varieties necessary for beautification and wildlife projects.

OTHER FEDERAL PROGRAMS

DEPARTMENT OF DEFENSE

The Department of Defense recognizes that the management of forests, vegetative cover, soil, water and related mineral resources is vital to meeting the needs of future generations and to the safety and welfare of the nation.

The Seneca Army Depot covers 10,687 acres, of which 2,960 acres are forested. An additional 340 acres are classified as open land best suited for forest production and are to be reforested by planting. There are 7,000 acres of open land suitable for agriculture; however, efforts to lease this land have been unsuccessful. If at a later date it is determined that the land cannot be leased, it will be classified as forest land and reforested.

Forestry accomplishments over the past 10 years on the Seneca Depot include:

Timber harvest	260 acres
Timber stand improvement	100 acres
Tree planting	440 acres

Griffiss Air Force Base administers approximately 3,000 acres scattered throughout the Basin. The forested area in these sites is too small to manage for commercial forest purposes.

DEPARTMENT OF INTERIOR

The Department of Interior, Fish and Wildlife, administers the Montezuma National Wildlife Refuge which covers 6,820 acres of land and water at the north end of Cayuga Lake. This area is managed as a haven for waterfowl and other wildlife. Approximately 100 acres are forested.

STATE PROGRAMS

MULTIPURPOSE WATER RESOURCES PLANNING PROGRAMS

Reconnaissance Studies

Reconnaissance Studies, also called *Preliminary* or *Framework* Comprehensive studies, are designed to provide broad scale analysis of water and related land use needs and opportunities. They also give general appraisals of an area's capabilities and possible measures for meeting water resources requirements and regional development goals.

Statewide water resources reconnaissance studies were carried out by the Department of Environmental Conservation. These studies were completed in 1966.

To accomplish this task, the State was divided into three regions, following major river basin boundaries. One of these areas, called the *Central Region,* includes the Oswego River Basin. It also covers the Susquehanna River Basin, and Central and Eastern Lake Ontario drainage area.

Water resources needs, availability of water and potential reservoir sites were all studied. Results of the study provided generalized alternative development plans with preliminary cost estimates.

The reconnaissance effort was deliberately limited in duration and scope in order to provide a basic framework for further studies and development of a statewide water resources plan as rapidly as possible.

Comprehensive Water Resources Planning Studies -

Comprehensive water resources planning at the local level in New York State is conducted through regional water resources planning boards, and is subject to approval by the State Department of Environmental Conservation. The Department has primary responsibility for policy and overall planning concerning all of the State's water resources.

A board is composed of seven members selected by the Department from a list of nominees submitted by the counties involved. Five of the seven members represent each of five specified interests: agriculture, industry, public water supply, municipal corporations and outdoor recreation. The remaining two members are members-at-large.

Each board is responsible for evolving a comprehensive plan of development for its region's water resources.

The State Department of Environmental Conservation provides staff services to regional boards. Seventy five percent of study costs are borne by the State and the remaining 25 percent is borne by local entities.

Three boards are involved in the Oswego River Basin Study. They are the Eastern Oswego Board, the Cayuga Lake Board, and the Wa-Ont-Ya Board (see Figure 6.1).

The three boards have worked cooperatively throughout the study in order to develop a coordinated plan for the entire basin.

A fourth, the Chemung Board, although primarily concerned with planning for the Susquehanna River Basin, also includes the extreme southwestern portion of the Oswego River Basin. Most of Schuyler County, another small segment of Steuben County and a small part of Chemung County are in this section of the Oswego Basin. Although the Chemung Board has not taken an active part in the study, planning by this board and the three Oswego Basin Boards is coordinated for the area of common concern.

CAYUGA LAKE BOARD

Existing problems within this sub-basin area initially were brought to public attention by a number of private organizations and individuals. The Cayuga Lake Preservation Association, through State Senator Theodore Day of Seneca County, requested the former Water Resources Commission to undertake a study of these problems and to recommend solutions. Accordingly, after petition by the counties involved, the Cayuga Lake Board was established in 1964.

Major hydrologic units in the Oswego Study which affect this sub-basin include the Cayuga Lake Watershed, the Seneca Lake Watershed and the Montezuma Unit.

WA-ONT-YA BOARD

Established by the former Water Resources Commission in 1965, this board's primary concern in the Oswego Study lies with Wayne, Ontario and Yates Counties. This area includes all of Canandaigua Lake and nearly all of its drainage basin; part of Keuka Lake and its drainage basin; part of Seneca Lake; and the Wayne County portion of the Barge Canal with the associated part of its drainage basin.

EASTERN OSWEGO BOARD

In 1967, the last of the three Oswego Boards began operation after authorization by the former Water Resources Commission.

The Eastern Oswego sub-basin covers the area draining to the Oswego River downstream from and including Owasco Lake and its outlet. Oneida Lake is one of the most important hydrologic units in the sub-basin, and Skaneateles, Onondaga, Otisco and Cross Lakes also lie within its boundaries. The area's major rivers are the Oswego and the Oneida, and about 840 square miles of the Seneca River's drainage are also in the sub-basin.

Almost half of the water resources available to the Eastern Oswego area originates outside its boundaries, and this board, therefore, has a particularly vital concern in many hydrologic units within the study areas of the other two Oswego Boards.

Project Planning Studies -

These are detailed economic and engineering investigations of water resources projects recommended in regional or river basin early-action development plans. They include the following elements, which are also covered in less detail in preceding comprehensive studies:

- Field work at the dam site, including soil test borings.
- Systems analysis and alternatives for design of the reservoir, dam and spillway.
- Benefit/cost evaluations.
- Cost allocations.
- Financial plan for construction, operation and maintenance of the dam, reservoir, and associated project lands.

This stage of planning has not been reached in the Oswego Basin (as of June, 1971). An example of such a study is the recently completed Sandridge Project Planning Study, in the Erie-Niagara Basin.

OTHER PROGRAMS

STATE PURE WATERS PROGRAM

In 1965, State legislation was approved, providing funds for sewage treatment facilities to combat water pollution.

This law, the Pure Water Bond Act, allocated $1 billion for a massive, six year cleanup of the state's waters. It pays the state's share and pre-finances the federal share of sewage treatment plant construction and facilities costs, to meet stream classification standards established by the former Water Resources Commission throughout the state.

The Pure Waters Program, as mentioned earlier, is administered through the Department of Environmental Conservation. As part of the program many comprehensive, county-by-county sewerage studies have been completed throughout the state. Several are still in progress. In the Oswego Basin, these studies have been completed in all counties except in Seneca, Yates and Cayuga (due in mid-1971), in Madison, where studies will begin after mid-1971 and in Lewis County, where no study has yet begun.

COMPREHENSIVE PUBLIC WATER SUPPLY STUDIES

Conservation Law, Part V-A authorizes special studies to be made for the purpose of developing a master plan for public water supply to meet present and projected water demands to the year 2020. Under the administration of the New York State Health Department, studies have usually been conducted over a county-wide or multi-county area. The studies recommend alternative plans including sources of supply, treatment and transmission facilities, and storage and distribution systems. In the Oswego River Basin, all counties are in some stage of study: nine reports have been published; five are under way and in one county (Lewis) an application for study has been submitted.

STATE AGRICULTURAL RESOURCES COMMISSION

In early 1969, the Legislature established an Agricultural Resources Commission for New York State. Creation of this Commission was recommended in the final report to the Governor (1968) of the State's Temporary Commission on the Preservation of Agricultural Land.

Administratively attached to the State Department of Agriculture and Markets, this Commission will, when fully staffed, participate actively in all regional and statewide planning programs. Specifically, Commission staff will provide planners with accurate, timely and meaningful information on agriculture in the state, and will assist in the development and improvement of methods for carrying out plans.

Members of the Commission include private citizens from major sectors of the state's agricultural industry. The Commissioner of Agriculture and Markets, the Director of the State Office of Planning Coordination, and the Dean of the New York State College of Agriculture are also ex-officio members.

Particular state planning programs in which this Commission will participate are: highways; water resources (including water quality); conservation and open space; development of rural recreation facilities; and general health and sanitation program.

GENERAL STATEWIDE PLANNING PROGRAM

Multi-resource long-range planning for the entire state is carried out by the Office of Planning Coordination (OPC). This agency sponsors both regional and statewide planning programs, coordinates functional planning of individual state departments and agencies with the overall state development plan, and coordinates state, federal and local planning. The Department of Environmental Conservation provides water resources planning for this office.

Results of water resources studies are incorporated in regional and local planning by OPC's Regional Planning Boards. Four such boards are involved in the Oswego River Basin: Central, Genesee-Finger Lakes, Southern Tier East, and Southern Tier Central.

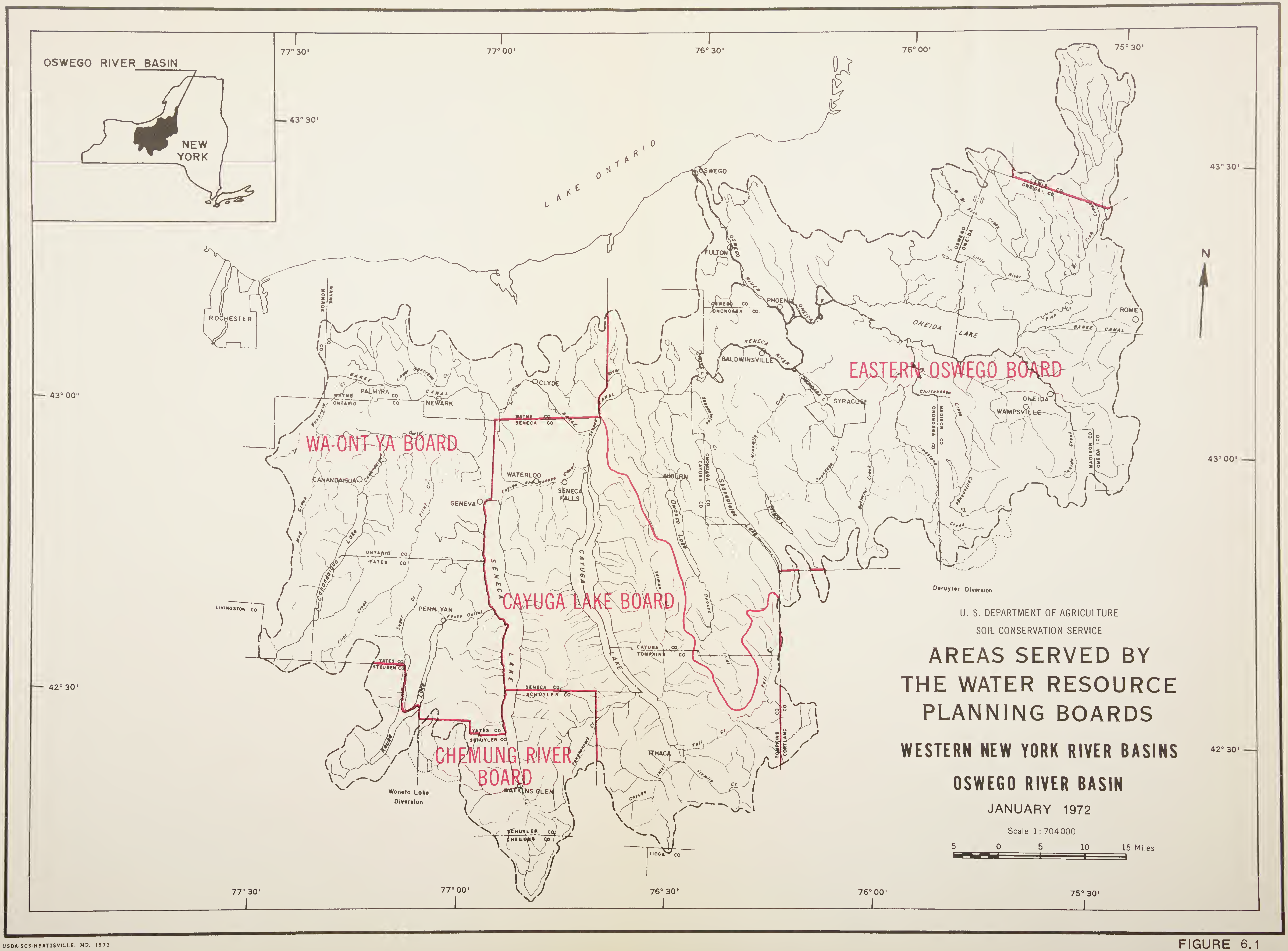

OSWEGO RIVER BASIN
NEW YORK
LAKE ONTARIO
WA-ONT-YA BOARD
CAYUGA LAKE BOARD
EASTERN OSWEGO BOARD
CHEMUNG RIVER BOARD
ROCHESTER
OSWEGO
FULTON
PHOENIX
BALDWINSVILLE
SYRACUSE
ROME
ONEIDA
WAMPSVILLE
AUBURN
CLYDE
PALMYRA
NEWARK
WATERLOO
SENECA FALLS
GENEVA
CANANDAIGUA
PENN YAN
ITHACA
WATKINS GLEN
ONEIDA LAKE
SENECA LAKE
CAYUGA LAKE
Deruyter Diversion
Woneto Lake Diversion
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
AREAS SERVED BY THE WATER RESOURCE PLANNING BOARDS
WESTERN NEW YORK RIVER BASINS
OSWEGO RIVER BASIN
JANUARY 1972
Scale 1: 704 000
5 0 5 10 15 Miles
USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 6.1

STATE AND LOCAL PROGRAMS

New York Forest Practice Act

The New York Forest Practice Act of 1946 provides for the establishment of definite standards for the practice of forestry on privately-owned woodlands in the state, and for assistance from the State Department of Environmental Conservation in carrying out these practices. Forest practices applicable to the various forest types in the district are established by District Forest Practice Boards. It is also the duty of these boards to promote application of forest practices.

The Act authorizes the Conservation Commissioner to establish forest districts. Parts of five districts are in the Oswego River Basin. Technically trained foresters in each district are responsible for carrying out the various forestry activities.

State Forest Land[1/] - There are approximately 49,500 acres of state forest land, of which 18,700 acres are in plantations, in the Oswego River Basin. These lands are managed by the New York State Department of Environmental Conservation, Division of Lands and Forests for multiple-use purposes to supply wood products, recreation, wildlife habitat, watershed and soil stabilization. Timber management accomplishments for the 10-year period 1958 to 1967 are shown in the following table:

TABLE 6.2 - TIMBER MANAGEMENT ACCOMPLISHMENTS ON STATE FOREST LAND IN THE OSWEGO RIVER BASIN, NEW YORK

Treatment Measures	Acres
Reforestation	
Open field planting	1,623
Reinforced planting	494
Timber stand improvement	3,573
Harvest cutting	1,479
Woodland grazing control protecting 13 miles	520
Logging road and skid trail erosion control protecting 3.5 miles	140

Most state forest land is open to public hunting and fishing. To date, there are very few highly developed facilities for recreational use located on state forest land. Hiking and snowmobile trails are available in many areas with additional trails being developed each year.

State Parks

The New York State Department of Environmental Conservation, State Office of Parks and Outdoor Recreation, administers approximately 9,600 acres of land which is predominantly forested within the Oswego Basin. This land is managed strictly for recreational use, with many highly developed facilities for intensive use.

Game Management Areas

The New York State Department of Environmental Conservation, Division of Fish and Wildlife, manages 15,000 acres of game management areas and 3,300 acres of wetland within the Basin. These areas are managed for fish and wildlife purposes.

COUNTY AND TOWN PROGRAMS

SOIL AND WATER CONSERVATION DISTRICT PROGRAMS

Soil and water conservation districts are legally constituted units or instrumentalities of state government created to administer soil and water conservation work within their boundaries.

1/ From data supplied by New York State Department of Environmental Conservation, Division of Lands and Forests

They sponsor or co-sponsor most watershed protection and flood prevention projects and resource conservation and development projects. By virtue of their broad activities, districts have an important role in the development of rural areas.

There are 18 soil and water conservation districts partially or wholly in the Basin area. These are the Cayuga, Chemung, Cortland, Lewis, Livingston, Madison, Monroe, Oneida, Onondaga, Ontario, Oswego, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne and Yates districts.

These districts focus attention on land and water problems, develop annual and long-range programs designed to solve the problems and enlist all the available help from public and private sources that will contribute to the accomplishment of the district's goals.

Adoption of conservation practices by landowners through the soil and water conservation districts is a major step in reducing erosion, sediment, and flood damage. Major practices now on the land include:

Conservation cropping systems	321,000 acres
Contour farming	69,400 acres
Diversions	327 miles
Drainage mains and laterals	1,087 miles
Pasture and hayland planting	88,800 acres
Ponds	4,400 (number)
Streambank protection	5 miles
Stripcropping	59,900 acres
Tile drains	2,677 miles

LOCAL PROGRAMS

Many local governments have individual plans for the management of water and related land resources. There are approximately 3,000 acres of county and town owned land which are managed for recreation and timber production. The type of management applied varies from town to town with the major emphasis on recreation.

CHAPTER VII

WATER AND RELATED LAND RESOURCE DEVELOPMENT POTENTIAL

Within any Basin there are potential developments which must be recognized and measured to evaluate their capacity to satisfy identified water and related land resource problems and needs. This chapter identifies the water and related land resource development potentials in upstream areas and those which primarily affect the agricultural community. Additional studies of larger impoundment sites are being undertaken by the Corps of Engineers and the Division of Water Resources of the New York State Department of Environmental Conservation.

Available cropland presently 1.2 million acres, is expected to decrease by the year 2020. This increases the importance of proper land use development. There are about 136,000 acres which have high development potential for irrigated agriculture.

An inventory of potential upstream water impoundment sites for surface water supply resulted in the identification of 193 sites supplying over 682,280 acre-feet of beneficial storage and over 43,500 acres of surface areas. These sites have the potential to meet some of the needs for flood prevention, irrigation, recreation, low flow augmentation, municipal and industrial water supply, and fish and wildlife.

Ground water has a definite development potential but the amount is not evenly distributed and is subject to variation within short distances. Additional study is needed to more closely define ground water potential at specific locations.

Existing surface water resources - streams, lakes, and the Barge Canal - need to be developed by acquiring and constructing public access facilities in order to fully utilize this potential source of recreational area.

About 24 miles of channel improvement could provide flood control and drainage improvement for over 4,700 acres of primarily agricultural land in five of the six project areas identified by USDA study. Further improvements are feasible by small groups and through larger group projects.

Six irrigation systems are feasible by using water from the Barge Canal to irrigate more than 9,000 acres of agricultural land along the canal. Individual systems from reservoirs also can be developed.

Water quality control can be used to upgrade the classification of many streams in the Basin.

AVAILABILITY OF LAND FOR POTENTIAL DEVELOPMENT

Land resources of the Basin have the potential to adequately satisfy most of the present and future needs of agriculture and forestry. The soil underlaying the agricultural and forest cover serves as the largest reservoir of water in the Basin. It holds the ground water which maintains base stream flow.

There will be some shifting of land use in many areas of the Basin. Cropland and pasture will decline while total forest land will increase until the year 2000 after which is is projected to remain relatively in area. Tree planting and the reversion of former agricultural land to forest will reduce cropland and pasture acreages. Moreover, some losses of agricultural and forest lands will occur for reservoirs, right-of-ways, housing developments, and other urban uses.

Many areas of forest land have traditionally been used primarily for timber production. This concept will not meet the challenges of the present and future. Multiple-use management on public forests has demonstrated that timber production, recreation, watershed management, and fish and wildlife habitat improvement are compatible and applicable to most forest lands.

It is expected that much of the Basin's forest land will be available to meet future timber demands as well as watershed, recreation, fish and wildlife and aesthetic needs. However, the availability of small tracts of private non-industrial forest land for these purposes is expected to be hindered by changing landowner interests and attitudes.

Land will be acquired for park and recreation areas. Some of this will be commercial forest land which will be shifted to non-commercial forest land as these parks and recreation areas are enlarged and/or formed.

RESOURCE MANAGEMENT POTENTIAL

Agricultural and forest lands are capable of producing not only the necessary food and fiber, but also are capable of multiple use management for watershed management, recreation, fish and wildlife habitat improvement, and the enhancement of environmental quality.

The physical potential of the Basin's land to improve hydrologically is medium to high. Given adequate protection and management through land use planning and the application of land treatment measures, the hydrologic conditions of these lands should continue to improve. Similarly, land use planning and the application of land treatment measures on urban-developing lands will minimize the deterioration of the land and water resources.

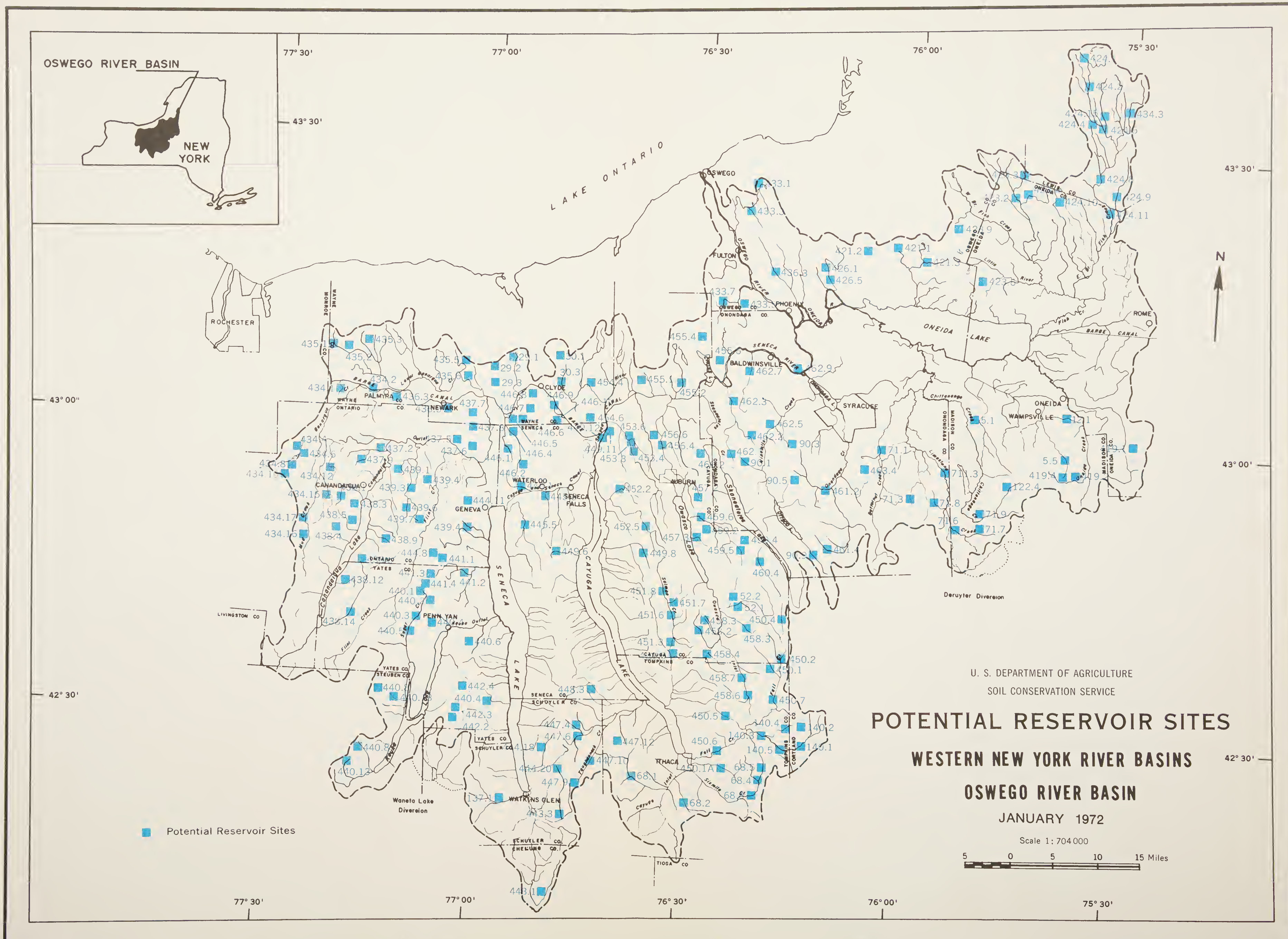
IMPOUNDMENTS

An inventory of upstream water impoundment sites was made to determine the capability of the Basin to meet present and projected needs from this source. Tentative locations were selected for 374 structures by a study of USGS topographic maps by the New York State Division of Water Resources and the Soil Conservation Service. This was followed by a field reconnaissance of each site.

One hundred ninety-three of the sites were appraised as having the best potential to meet flood control, irrigation, recreation, and fish and wildlife needs. A breakdown of the number of potential sites, storage capacity, surface area and costs by watersheds is presented in Table 7.1 and the distribution of the potential sites is shown on Figure 7.1. Detailed information for each site can be found in Appendix A to this report, *Preliminary Upstream Reservoir Studies*. This appendix describes the procedures used, contains maps showing the location of each site, and provides information concerning the design, cost, and geology of each structure.

RESERVOIR STORAGE POTENTIAL

These 193 sites could provide a total beneficial storage capacity of over 682,200 acre-feet, have a total surface area of 43,500 acres, and cost an estimated $168 million.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 7.1

TABLE 7.1 - NUMBER OF POTENTIAL SITES, STORAGE CAPACITY, SURFACE AREAS AND TOTAL INSTALLATION COSTS FOR WATERSHEDS IN THE OSWEGO RIVER BASIN, NEW YORK

Watershed Number	Name	Number of Sites	Beneficial Use: Storage 1/ (Ac. Ft.)	Beneficial Use: Surface Area (Acres)	Total Installation Cost $1,000 (Dollars)
5	Canastota Creek	2	5,020	180	2,590
11	Flint Creek	-	-	-	- 2/
12	Higinbotham Brook	1	2,420	100	460
29	Black Brook	3	3,840	410	910
30	Black Creek	2	3,850	850	910
52	Mill Creek	2	9,490	350	2,940
68	Inlet Creek	5	21,340	980	6,500
71	Limestone Creek	6	58,240	2,420	7,390
88	Mud Creek	-	-	-	-
90	Ninemile Creek	4	14,400	640	3,830
122	Chittenango Creek	2	11,060	920	1,480
127	Woods Creek	-	-	-	-
137	Glen Creek	1	5,990	140	2,420
140	Virgil Creek	5	25,940	1,000	6,680
142	Wood Creek	-	-	-	-
150	Naples Creek	-	-	-	-
419	Upper Oneida Creek	3	6,650	240	3,430
420	Lower Oneida Creek	-	-	-	-
421	North Oneida Lake	3	6,570	830	1,250
422	South Oneida Lake	-	-	-	-
423	West Br. Fish Creek	5	25,000	1,590	3,880
424	East Br. Fish Creek	10	123,790	5,570	21,930
425	Lower Fish Creek	-	-	-	-
426	Oneida River	3	12,090	1,720	1,880
433	Lower Oswego River	4	7,220	700	2,230
434	Mud Creek	10	20,300	1,640	4,890
435	Ganargua Creek	6	7,500	730	1,780
436	Barge Canal at Newark	2	3,750	240	1,210
437	Canandaigua Outlet	6	7,660	1,000	3,050
438	Canandiauga Lake	8	56,780	2,210	8,700
439	Rocky Run	5	7,940	760	2,710
440	Keuka Lake	10	19,370	920	6,230
441	Kashong Creek	4	7,030	720	1,580
442	Big Stream	3	21,550	930	4,360
443	Catherine Creek	2	2,920	140	1,490
444	Seneca Lake	6	11,300	650	4,510
445	Cayuga and Seneca Canal	3	9,940	1,370	2,400
446	Clyde River	9	24,890	2,510	4,790
447	Taughannock Creek	5	3,720	350	1,860
448	Trumansburg Creek	1	780	100	520
449	Cayuga Lake	4	4,290	780	1,590
450	Fall Creek	7	32,120	1,760	13,870
451	Salmon Creek	5	4,480	320	2,710
452	Yawger Creek	2	980	230	810
453	Crane Brook	3	1,800	230	1,520
454	Upper Seneca River	2	1,400	220	520
455	Cross Lake and Barge Canal	4	8,960	1,870	4,290
456	Owasco Outlet	2	9,870	880	2,720
457	Owasco Lake	2	2,970	260	1,170
458	Owasco Inlet	6	20,830	1,570	5,600
459	Dutch Hollow Brook	4	9,490	600	2,890
460	Skaneateles Lake	2	13,860	700	2,090
461	W. Br. Onondaga Creek	2	3,950	180	1,340
462	Lower Seneca River	6	17,030	1,200	5,220
463	Onondaga Lake	1	1,870	80	650
TOTAL	55 Watersheds	193	682,240	43,790	167,780

1/ Based on the maximum storage considered for each potential site
2/ Potential PL-566 Project

Specific needs have been identified for 124 of the selected sites. There are numerous sites in the Basin which are available for development but have no identified needs. Many of these sites have adequate storage for multipurpose use and can be developed by county, town or village officials or by private developers. These sites represent good potential for water resource development in the Basin.

TOTAL STORAGE POTENTIAL FOR VARIOUS USES

FLOOD PREVENTION

Two sites were identified which could help relieve downstream flood damages. Site 12-2 on Higinbotham Brook has been identified as a single purpose structure which will store 130 acre-feet. The second structure for flood prevention is site 426-3 on Six Mile Creek. Approximately 710 acre-feet of flood storage is available. Additional storage is available for multipurpose use - recreation and irrigation.

IRRIGATION

One hundred thirty-five sites were originally selected as having potential to supply irrigation water. All of the sites were evaluated for single purpose irrigation and 64 were found to have a benefit-cost ratio of 0.8:1.0 or better. Locations for these sites are shown in Figure 7.2. The major details for these sites are given in Table 7.2. More than 89,000 acre-feet of water can be supplied from these sites. Further analysis of the sites and their location near areas with specific needs revealed that 10 of these sites had the best potential to supply the needed water. Details can be found in Appendix C, *Irrigation* of this report.

WATER SUPPLY

The USDA study has revealed that 11 sites have the potential to help meet the water supply needs for 2020. These sites can store enough water to provide 7.14 cfs or 1.7 percent of the total Basin needs in 2020. There appears to be very little reservoir potential to store water to meet the needs of the remaining communities.

In many of the communities, such as Syracuse, the existing intake systems could possibly be increased to solve their problems. Still other villages could combine and buy water or construct their own system to a major lake. Information on these possible alternatives is on Figure 7.3 and in Table 7.3. It should be kept in mind that this is only one part of the Basin study and as other agencies complete their studies, other solutions may become apparent.

RECREATION

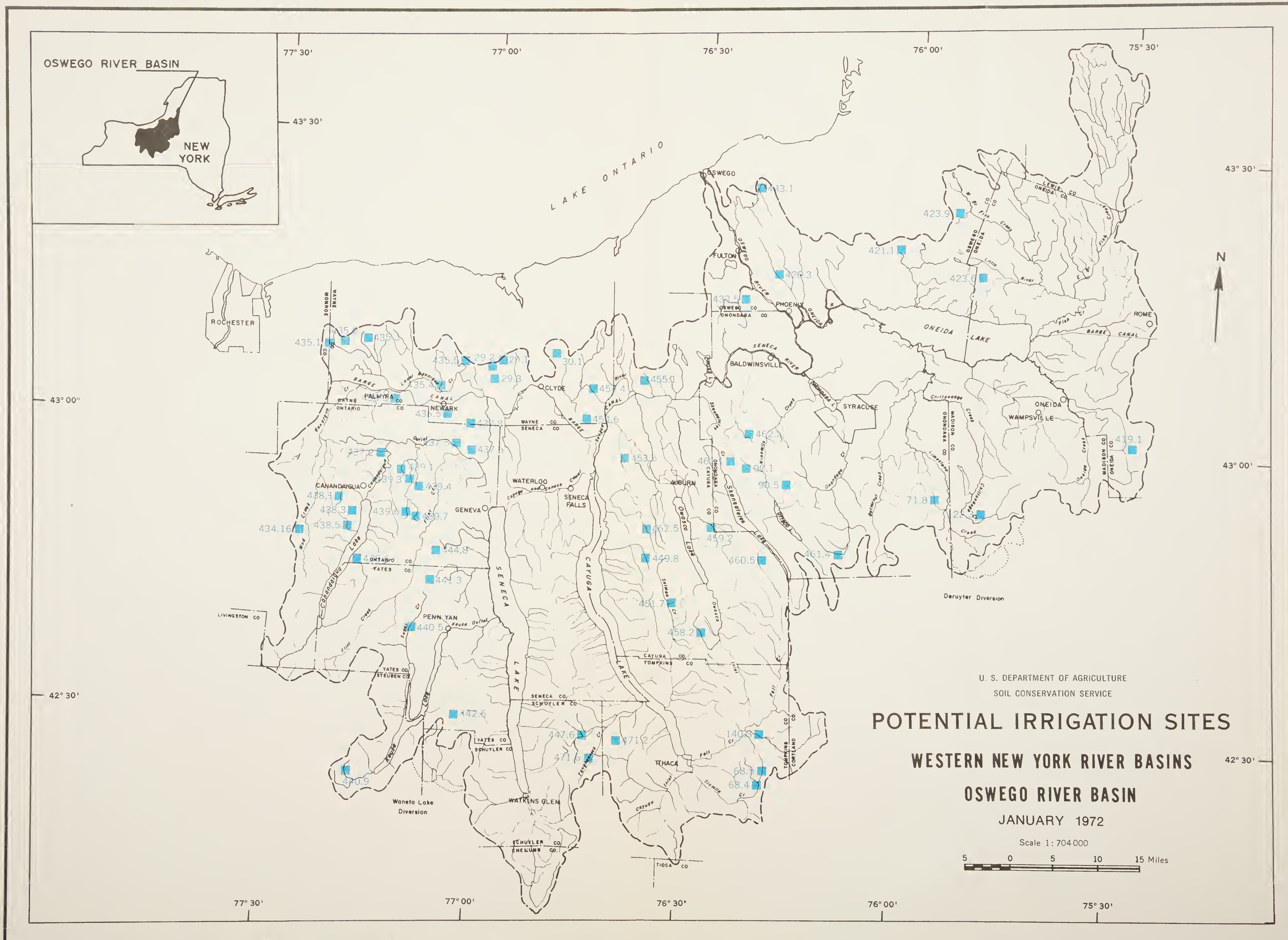
Thirty sites have been identified as having favorable characteristics for recreational development. These sites would provide about 16,790 surface acres and could be used to meet the public demand and supplement the State Park facilities. Figure 7.3 shows the location of the sites. Table 7.4 lists these potential recreation sites and gives pertinent information.

FISH AND WILDLIFE

Twelve structure sites were identified above stream reaches which have a need for additional water for fishing purposes. These sites can store 60,490 acre-feet of water for release during the summer months when stream flow is at a minimum. A total of 115.1 cfs could be released. Table 7.5 gives the storage and release rates for these sites. Figure 7.4 shows their location.

WATER QUALITY MANAGEMENT

The Finger Lakes offer large quantities of water for quality control if properly managed. To supplement a program of lake management for downstream quality control, five sites could be used to supply additional water. More than 39,000 acre-feet of storage is available which would allow a release of 77 cfs continuous throughout the year. Table 7.6 and Figure 7.4 show the location and pertinent data for these sites.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 7.2

TABLE 7.2 - POTENTIAL IRRIGATION SITES, OSWEGO RIVER BASIN, NEW YORK

Watershed Number	Watershed Name	Number of Sites	Available Storage 1/ (Ac. Ft.)	Expected Yearly 2/ Need (Ac. Ft.)	Install. Cost 3/ ($1,000)
29	Black Brook	3	1,490	1,290	586
30	Black Creek	1	200	200	118
68	Inlet Creek	2	7,050	1,260	915
71	Limestone Creek	1	1,150	620	160
90	Nine Mile Creek-Otisco Lake	2	4,270	1,080	583
122	Unnamed Tributary of Chittenango Creek	1	10,000	880	393
140	Virgil Creek	1	580	540	400
419	Upper Oneida Creek	1	620	620	470
421	North Oneida Lake	1	520	520	279
423	West Br. Fish Creek	2	2,180	780	396
426	Oneida River	1	3,600	740	387
433	Lower Oswego River	2	1,350	1,280	801
434	Mud Creek	1	480	330	124
435	Ganargua Creek	5	1,720	1,590	966
436	Barge Canal at Newark	2	2,440	800	584
437	Canandaigua Outlet	4	5,490	4,400	2,285
438	Canandaigua Lake	4	2,970	1,540	1,201
439	Rocky Run	5	5,240	3,980	2,078
440	Keuka Lake	2	2,960	1,050	554
441	Kashong Creek	1	2,400	1,240	360
442	Big Stream	1	4,400	580	300
444	Seneca Lake	1	1,200	1,100	388
446	Clyde River	4	7,630	2,260	1,266
447	Taughannock Creek	3	3,090	1,840	999
449	Cayuga Lake	1	470	470	226
451	Salmon Creek	1	1,000	960	490
452	Yawger Creek	1	860	860	429
453	Crane Brook	1	480	460	247
454	Upper Seneca River	2	1,050	1,050	539
455	Cross Lake and Barge Canal	1	850	380	234
458	Owasco Inlet	1	2,750	1,060	670
459	Dutch Hollow Brook	1	580	580	265
460	Skaneateles Lake	1	4,400	720	407
461	West Br. Onondaga Creek	1	1,160	330	260
462	Lower Seneca River	2	3,350	990	737
TOTAL		64	89,980	38,380	21,097

1/ Maximum amount of beneficial storage based on topographic limitations or annual expected yield from watershed.

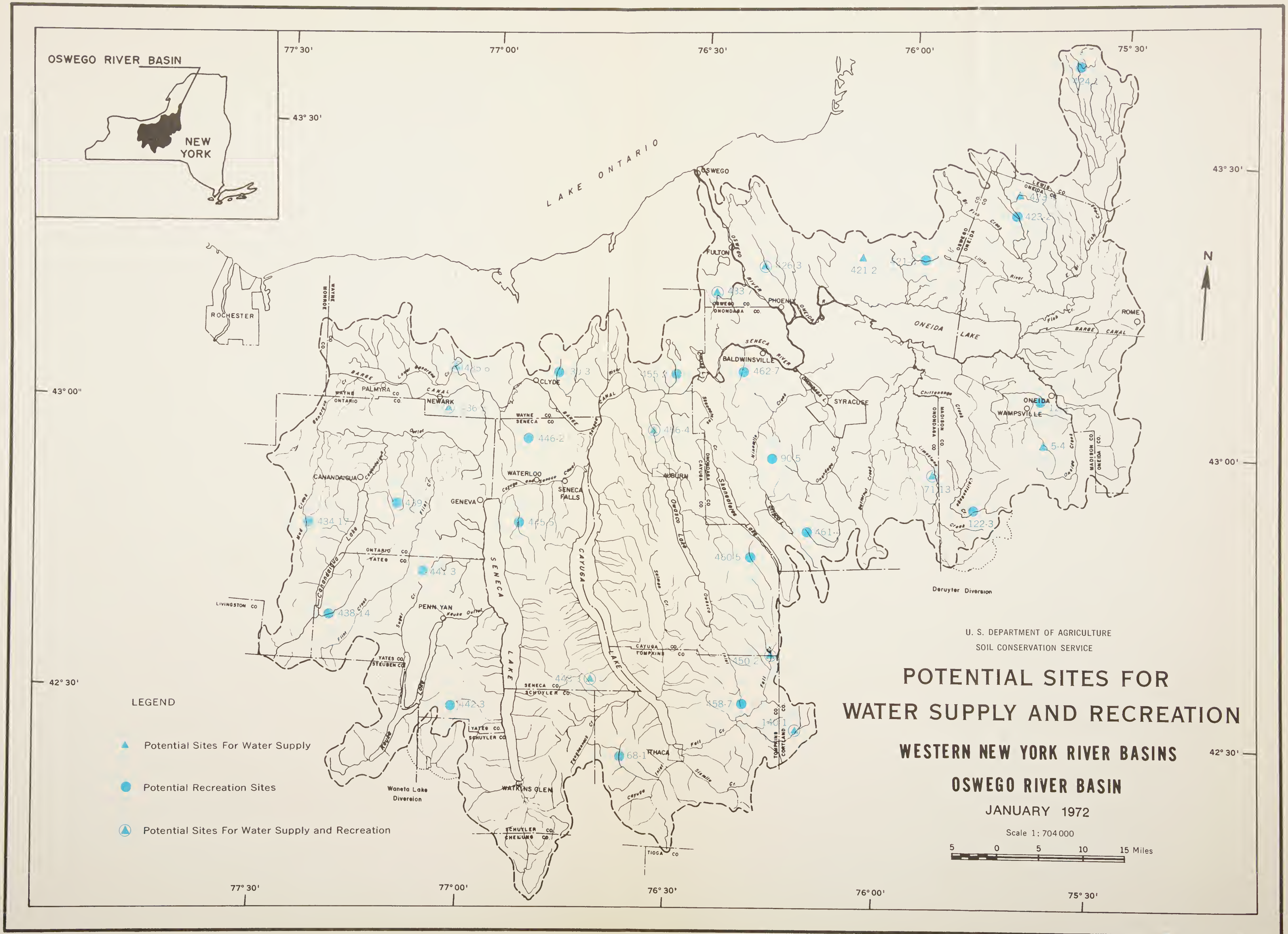
2/ Each acre-foot of storage is estimated to irrigate one acre of land.

3/ Cost computed for that amount of storage considered necessary for the expected yearly needs.

TABLE 7.3 - POTENTIALS FOR SUPPLYING MUNICIPAL WATER SUPPLY NEEDS, OSWEGO RIVER BASIN, NEW YORK

County	Town	Amount Required cfs	Amount Supplied cfs	Source	Remarks
Cayuga	Auburn	12.39		Owasco Lk.	
	Brutus	1.82	7.5	Site 456-4	Alt. Site 456-5
	Owasco	4.24		Owasco Lk.	
Madison	Cazenovia	3.45		Site 71-13	Large Multi. Site
	Lenox	9.39	3.6	Site 5-4	
	Oneida	12.28			
	Sullivan	16.40			
Oneida	Camden	1.73	1.4	Site 423-4	
	Verona	4.30			
Onondaga	Baldwinsville	10.75		Ontario Lk.	Connect to OCWA
	Lafayette	4.07		Ontario Lk.	Connect to OCWA
	OCWA 1/	200.65		Ontario Lk.	Enlarge system
Ontario	Canandaigua	6.87		Canandaigua Lk.	
	Geneva	6.53		Seneca Lake	
	Manchester	0.34		Well	
Oswego	Fulton	6.58	5.2	Site 426-3	
	Hastings	3.87	4.0	Site 421-2	
	Phoenix	3.78	5.7	Site 433-7	
Seneca	Seneca Falls	4.55		Seneca Lake	
Tompkins	Dryden	8.79	30.0	Sites 140-1 & 450-2	Well can also be used
	Ithaca	42.16		Sites 140-1 & 450-2	
Wayne	Lyons	0.42		Site 435-6	A county water system could be established from Lake Ontario
	Macedon	6.48			
	Newark	6.08		Site 436-5	
	Palmyra	3.46			
Yates	Penn Yan	4.89		Keuka Lake	

1/ Onondaga County Water Authority



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 7.3

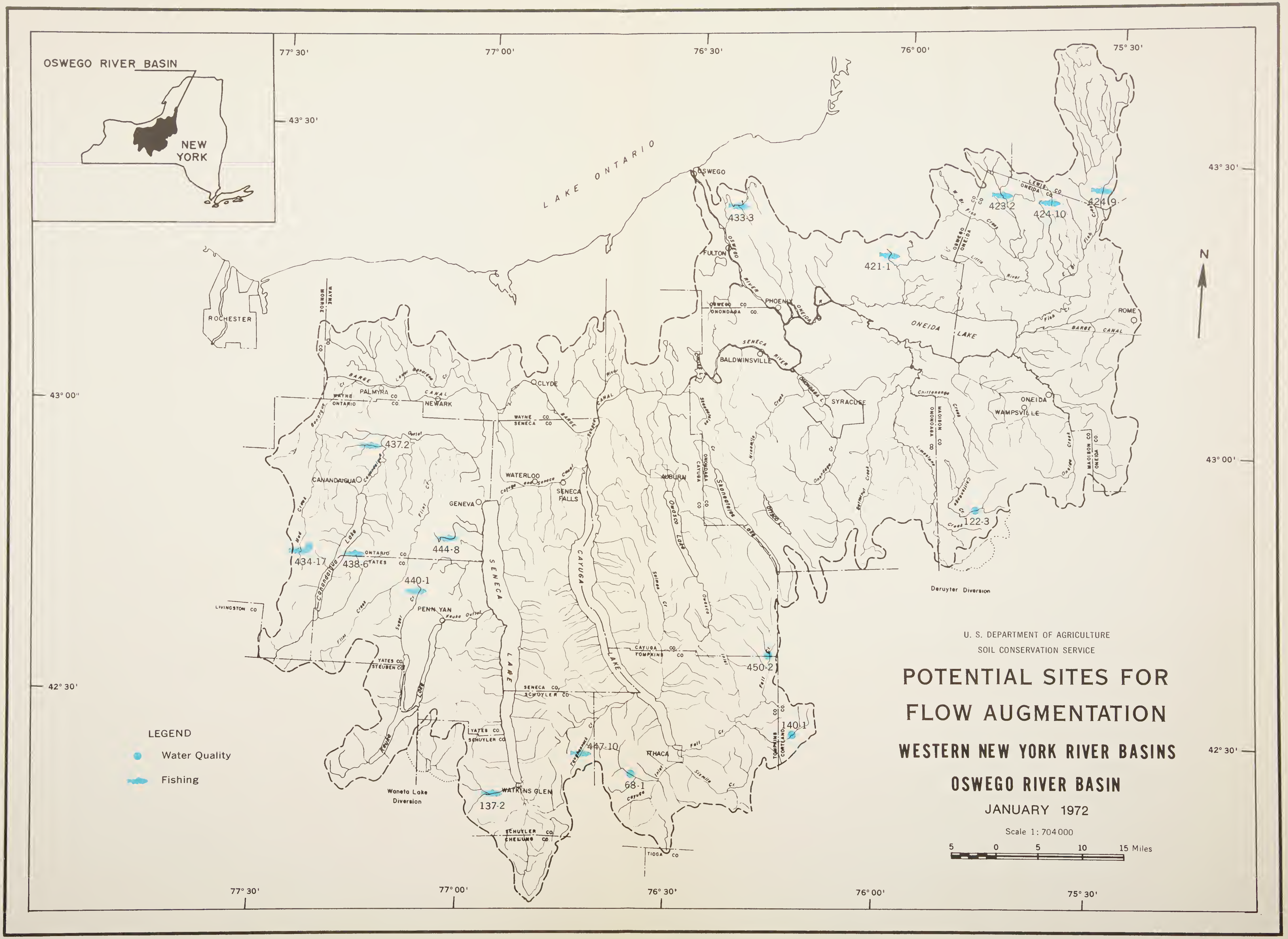


FIGURE 7.4

USDA-SCS-HYATTSVILLE, MD. 1973

TABLE 7.4 - SURFACE ACREAGE AND COUNTY LOCATION OF POTENTIAL RECREATION DEVELOPMENTS, OSWEGO RIVER BASIN, NEW YORK

Site	Surface Area (Acres)	County	Site	Surface Area (Acres)	County
12-1	100	Madison	438-14	1,500	Yates
30-3	780	Wayne	439-7	280	Ontario
68-1	260	Tompkins	441-3	580	Yates
71-13	1,720	Onondaga	442-3	340	Yates
90-5	130	Onondaga	445-5	640	Seneca
122-3	870	Madison	446-2	260	Seneca
140-1	700	Cortland	448-3	100	Seneca
421-3	420	Oswego	450-2	770	Seneca
423-2	1,050	Oneida	452-5	170	Cayuga
424-1	410	Lewis	455-2	1,420	Cayuga
426-3	400	Oswego	456-4	670	Cayuga
433-7	360	Oswego	458-7	680	Tompkins
434-17	680	Ontario	460-5	630	Cayuga
435-6	280	Wayne	461-4	150	Onondaga
436-5	170	Wayne	462-7	270	Onondaga
GRAND TOTAL			30 Sites	16,790	

TABLE 7.5 - POTENTIAL SITES FOR LOW FLOW AUGMENTATION FOR FISH HABITAT MAINTENANCE, OSWEGO RIVER BASIN, NEW YORK

Site No.	Stream Name	Beneficial Storage (Ac. Ft.)	Yield (cfs)
137-2	Glen Creek	5,980	9.7
421-3	Crandall Creek	2,960	0.6
423-2	Mad River	17,200	42.0
424-9	Rock Creek	11,720	25.1
424-10	Florence Creek	7,200	13.1
433-3	Trib. of Black Creek	1,020	4.8
434-17	Mud Creek	9,000	14.7
437-2	Padelford Brook	2,400	0.4
438-6	Trib. of West River	350	0.5
440-1	Trib. of Sugar Creek	440	1.2
444-8	Burrell Creek	1,190	1.4
447-10	Taughannock Creek	990	1.6
12 Sites		60,490	115.1

TABLE 7.6 - POTENTIAL SOLUTIONS TO WATER QUALITY PROBLEMS, OSWEGO RIVER BASIN, NEW YORK

Needs	Possible Solutions	Water Available (cfs)
Barge Canal at		
Macedon	)	15
Palmyra	)Sites 434-17	
Newark	)	
Geneva	)	
Waterloo	)Seneca Lake	
Seneca Falls	)	
Auburn	Owasco Lake	
Ithaca	Sites 450-2; 68-1	24
Dryden	Site 140-1	12
Cazenovia	)Site 122-3	26
Chittenango	)	
Oneida	)	
Lafayette	)No Sites	
Canastota	)Available	
Verona	)	
TOTAL		77

GROUND WATER DEVELOPMENTS

Ground water sources can be further utilized to supply future needs for on-farm consumption as well as for irrigation water supplies. Unfortunately, many areas of large ground water potential are the same areas of poor water quality. In addition, the amount of available ground water is not evenly distributed and is subject to variations within short distances. However, it appears that there is adequate ground water over the Basin to satisfy on-farm supplies except for irrigation, through the development of individual wells. Further studies need to be made to more adequately define ground water quantity, quality, and location.

EXISTING SURFACE WATER DEVELOPMENTS

Existing water resources in the Basin have a much higher potential for use. Insufficient access to the numerous streams and lakes prevents public use. Numerous lakes in the Basin have potential for more intensive use. Proper management and regulation of the Finger Lakes can provide water for quality control, irrigation, recreation, and water supply at downstream locations. Upstream reservoirs are available to provide better regulation of lake levels if needed. A more constant water level could be maintained and allow for more efficient use of the lakes themselves. Recreational use of the lakes could also be increased by the construction of more public access areas.

The potential of the New York State Barge Canal to help meet Basin water needs is great. Water is available for boating, swimming, fishing, irrigation, and water supply. However, the water must be maintained at a higher quality along the entire length if it is to be used for all of these purposes.

CHANNEL IMPROVEMENTS

After exhaustive alterntive studies considering all environmental aspects have been completed and when these studies show that the benefits outweigh the cost plus environmental losses, only then will channel improvement be recommended by the USDA.

Because of relatively flat topography in much of the Basin, channel improvement often is the only potential solution to flood plain problems. Twenty-four miles of channel work could provide flood control and agricultural drainage for five of the seven identified project areas. This will provide protection to more than 4,700 acres of agricultural land against the 10-year frequency storm. Potential for channel improvement exists in Rome Muck in Oneida County, Sodus Ditch in Wayne County, and Six Mile, Black and Wine Creeks in Oswego County. These channel improvements will have little affect on the stream fishery resources. Pertinent data on the channel designs can be found in Appendix B, *Special Project Studies Under USDA Programs*.

Additional channel improvement may be feasible on a group basis to solve common problems. This would be especially true in the Ontario-Mohawk Plains section of the Basin. Figure 7.5 outlines those areas having potential for drainage improvement.

IRRIGATION SYSTEMS

Seven irrigation water distribution systems, based on use of water from the New York State Barge Canal were analyzed. (See Figure 7.6). Five of the systems have a favorable benefit-cost ratio. These systems would provide irrigation water to 9,300 acres out of 18,000 acres suitable for irrigation. Benefits from irrigation are estimated to be $280,000 annually. The Division of Water Resources has looked at other systems including use of the Barge Canal and additional possibilities exist.

Additional systems for individual reservoirs have favorable benefit-cost ratios and can also be developed. Details on all of these systems can be found in Appendix C, *Irrigation*. Table 7.7 gives a summary of what lands can be irrigated.

TABLE 7.7 - IRRIGABLE LANDS IN THE OSWEGO RIVER BASIN, NEW YORK SUMMARIZED BY COUNTIES

County	Lands that can be supplied with irrig. water for less than $30 by source 1/				
	Existing Surface Water (ac.)	Ground Water (ac.)	Reservoirs (ac.)	Within 1/2 Mile of Canal (ac.)	Net 2/ Land (ac.)
Cayuga	31,300	0	5,500	1,300	36,500
Chemung	0	0	0	0	0
Cortland	0	0	0	0	0
Lewis	0	0	0	0	0
Madison	14,900	2,000	900	0	15,800
Monroe	0	0	0	0	0
Oneida	24,900	0	1,100	1,900	26,800
Onondaga	48,500	1,200	3,000	2,600	53,700
Ontario	29,700 3/	100	10,200	200	33,800 3/
Oswego	18,600	0	2,900	1,200	21,000
Schuyler	0	0	900	0	900
Seneca	19,100	0	1,000	1,500	20,600

Cont'd.
TABLE 7.7 - IRRIGABLE LANDS IN THE OSWEGO RIVER BASIN, NEW YORK SUMMARIZED BY COUNTIES

County	Lands that can be supplied with irrig. water for less than $30 by source 1/ Existing Surface Water	Ground Water	Reservoirs	Within 1/2 Mile of Canal	Net 2/ Land
	(ac.)	(ac.)	(ac.)	(ac.)	(ac.)
Steuben	400	400	400	0	400
Tompkins	1,000	300	2,700	0	3,200
Wayne	24,500 3/	7,000	7,300	3,400	30,100 3/
Yates	12,900	0	2,600	0	15,000
TOTALS	225,800	11,000	38,500	12,100	262,900

1/ Rounded to closest 100 acres.
2/ Net land reduces the total irrigable land by allowing percentage for gross areas as well as for areas that can be served by alternate sources.
3/ Includes land irrigable from Canandaigua Lake Outlet.

WATER QUALITY CONTROL

To explain the management necessary for water quality control, the following is quoted from the report entitled, *Developing and Managing the Water Resources of New York State.* 1/

> *"The State Water Resources Commission has classified the streams in the region as to their best usage in the interest of the public. Using these classifications and specified minimum dissolved oxygen contents, preliminary estimates have been made of the effects of present and future biochemical oxygen demand discharges on the streams in the region. The most important locations where consideration is needed (sic for low flow augmentation) in the Oswego Basin are the Seneca River at Seneca Falls, the Owasco Lake Outlet below Auburn, Oneida Creek below Oneida and Oswego River at Fulton".*

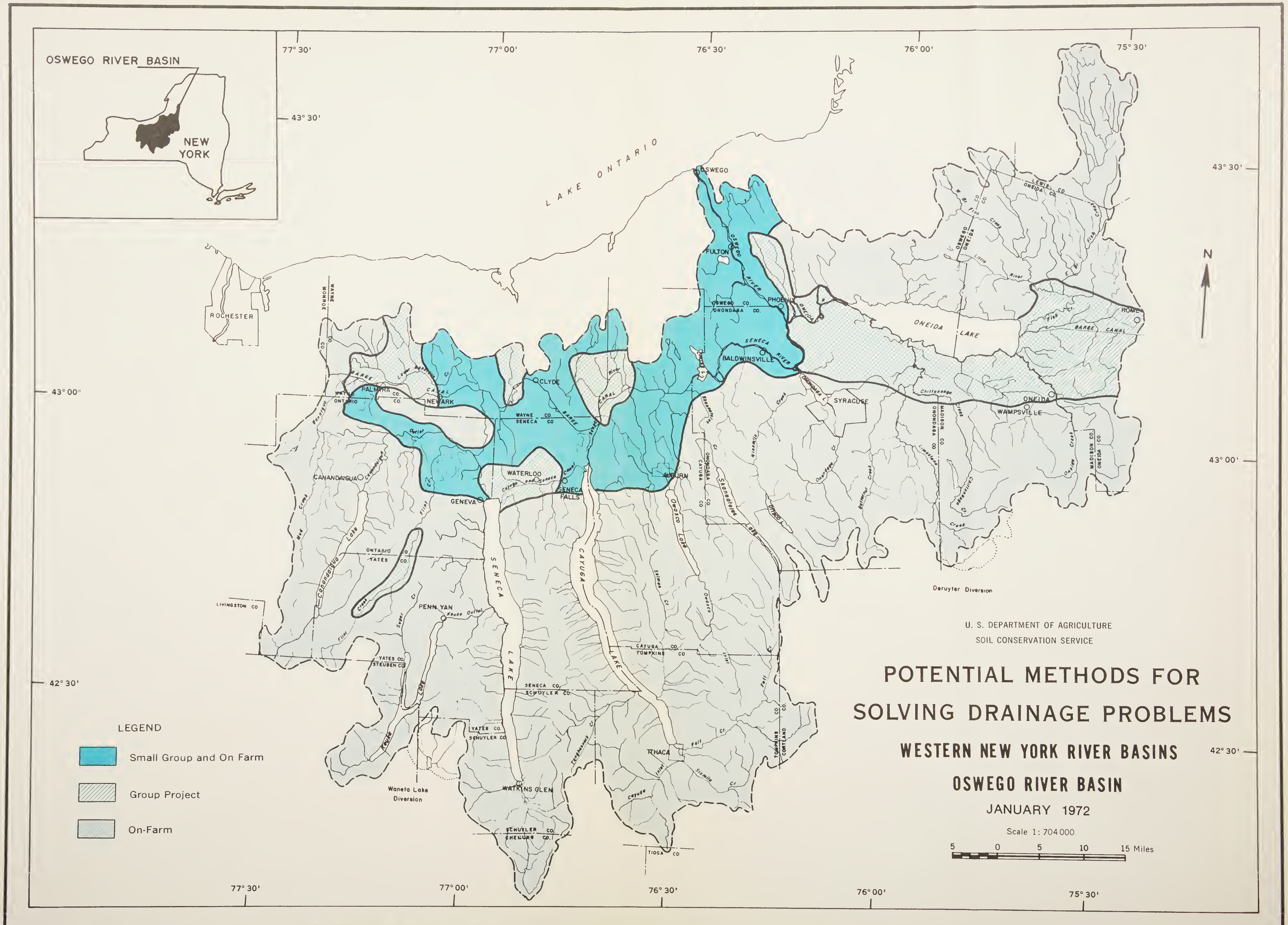
The State of New York through its *Pure Waters* program initiated in 1965 is attempting to ensure that all waters will meet the stream classification standards set by the Water Resources Commission. As a direct result of this program and its available funds, many municipalities and industries are in the process of planning and constructing adequate waste treatment facilities. This alone will do much to alleviate some of the problems. The potential of augmentation from reservoir sites which is also needed to assist during times of natural low flow is good.

Continuing research is leading to the development of pesticides with a higher degree of specificity and with corresponding reduced chances of damage to non-target organisms. Biological and other methods of pest control are being developed which will eliminate the need for chemicals in controlling some pests.

Because of the methods of placement of fertilizers on agricultural lands almost all of the fertilizer is used by the crop and losses to streams is minimal. This loss can be kept at this level by continuing to educate users to the possible harmful effects of fertilizers and crop production benefits derived from proper fertilizer placement.

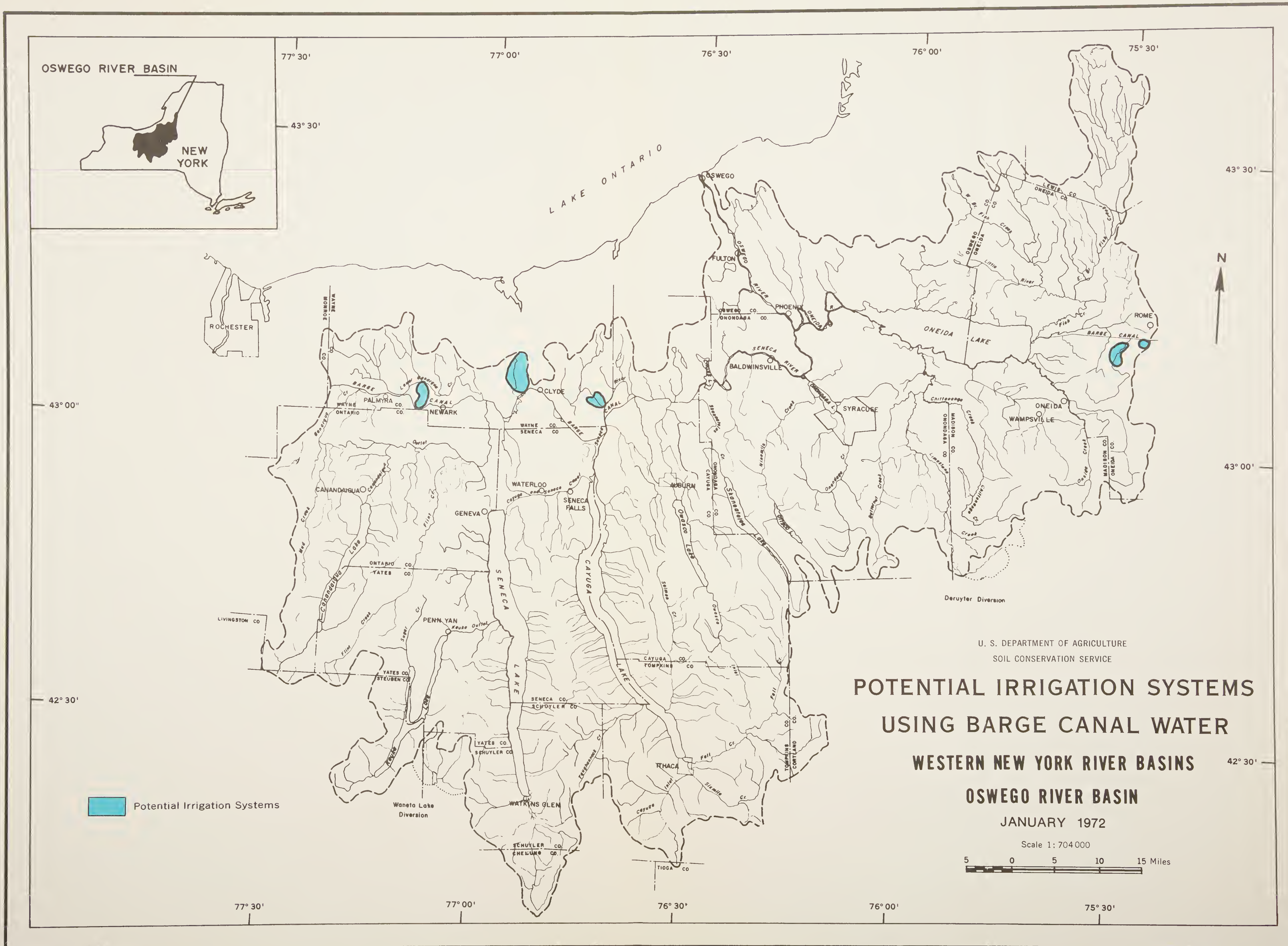
Further, land treatment measures installed on uplands can reduce sediment, fertilizers and pesticide losses from the land to a minimal level. Again, continuing education of landowners, stressing the benefits derived from the installation of land treatment measures is necessary.

1/ *Developing and Managing the Water Resources of New York State.* Division of Water Resources, New York State Department of Environmental Conservation, Albany, New York, 1967 pp. 48-49.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 7.5



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 7.6

CHAPTER VIII

OPPORTUNITIES FOR DEVELOPMENT AND IMPACT OF PROGRAM PROPOSALS

This chapter describes the nonstructural and structural opportunities for development of the water and related land resources of the upstream areas of the Basin. Other opportunities exist, but must be handled by other programs and are discussed in Chapter IX. The following measures were identified by the USDA agencies.

OPPORTUNITIES FOR DEVELOPMENT

A summary of the nonstructural and structural opportunities for development of the water and related land resources for the upstream areas of the Basin are briefly discussed. These are measures identified by the USDA agencies and concurred in by other Federal agencies and the State of New York. Both the Early Action Program and the potential allocated to the 2020 program are listed. Overall estimates of program benefits and costs are shown.

Indiscriminate use of land will continue to cause it to deteriorate. Rapid changes in land use are anticipated to occur as urban areas expand. Land disturbance during urban construction and improper land use will cause high soil losses which will pollute streams and lakes. These conclusions indicate the importance of recommending a strong program including environmental education, land resource planning, land treatment and structural measures.

Basically, there are only two major structural programs available under USDA authority - the Public Law 566 program and the Resource Conservation and Development program. Under the going programs of the Forest Service, structural measures can be constructed on the Hector Land Use Area when funding is available. The location of the various structural projects recommended is shown in Figure 8.1.

Projects applicable to PL-566 are those potential developments which have flood control or irrigation as the primary purpose. However, it should be recognized that present administrative constraints limit the program to projects having flood control as the primary purpose. Because of this constraint, the PL-566 irrigation projects are recommended under the long range program and the flood control projects under early action programs.

The other structural program of the USDA is the RC&D program. A small part of the Basin, Madison and Cortland Counties, are in the South-Central Resource Conservation and Development Project. Federal funds are authorized and could provide for up to 50 percent of the construction cost. Three single purpose recreation sites are recommended for consideration as potential development projects within this RC&D area. These sites range in cost between $644,000 and $3,622,000 (including facilities).

EARLY ACTION (1980)

Environmental Education

The New York State Department of Environmental Conservation, in cooperation with the USDA has tremendous potential to educate the landowner. Landowners can be made aware of the role their lands play in maintenance of good watershed conditions and the importance of protecting them from excess erosion, fire, detrimental logging practices, and excessive livestock use.

Their knowledge of the potential multiple-use of their lands can be increased. Their attitudes and interests can be stimulated with respect to the merits of instituting specific management practices and of the numerous public assistance opportunities that are available.

More than 350,000 acres of agricultural and forestland need land treatment measures installed in the next 10 years. Because the average farm size is 164 acres and 91 percent of the small private forest holdings average 30 acres in size, numerous owners are involved and many of them have alternative land use interests. A great majority are not fully aware of the value of land treatment or the multiple use potential of their lands.

The education of these landowners concerning the role they and their lands can play in solving Basin needs is vital. Therefore, an accelerated program of environmental education is needed to aid in securing the most desirable development of the Basin and region. Land resource and management courses could be offered through the adult education programs, environmental education in public schools could be improved and expanded, and more of the publicly owned lands could be used for demonstration areas. Thus, present and future rural landowners would have the opportunity to learn of the various land use and management alternatives available to them. Such a program could be expected to increase landowner interest in multiple use and management of land resources. Similar education programs can be used with urban people.

Land Resource Planning

Land resource planning is important to insure the orderly development of the land. Soil survey information can be used for total resource and environmental planning. Overall planning goals can be established and people can pride themselves in working toward these goals.

Broad resource planning can be used to coordinate land use; resource development, management, and utilization; and economic development to meet community expressed objectives. Soil and water conservation districts have the opportunity to bring together all agencies and groups concerned with meeting these objectives. Districts are providing financial assistance to accelerate and complete the soil survey programs conducted by the Soil Conservation Service and Cornell University Agricultural Experiment Stations within the next 10 years.

Soil survey together with special interpretive soils reports and resource inventories can be used as basic elements in total resource and environmental planning. Such planning is needed for the orderly development of agriculture, forestry, fish and wildlife, and recreation. It is also needed to coordinate land use regulations and the development of community and public facilities for urban- developing areas and rural communities.

Land Treatment

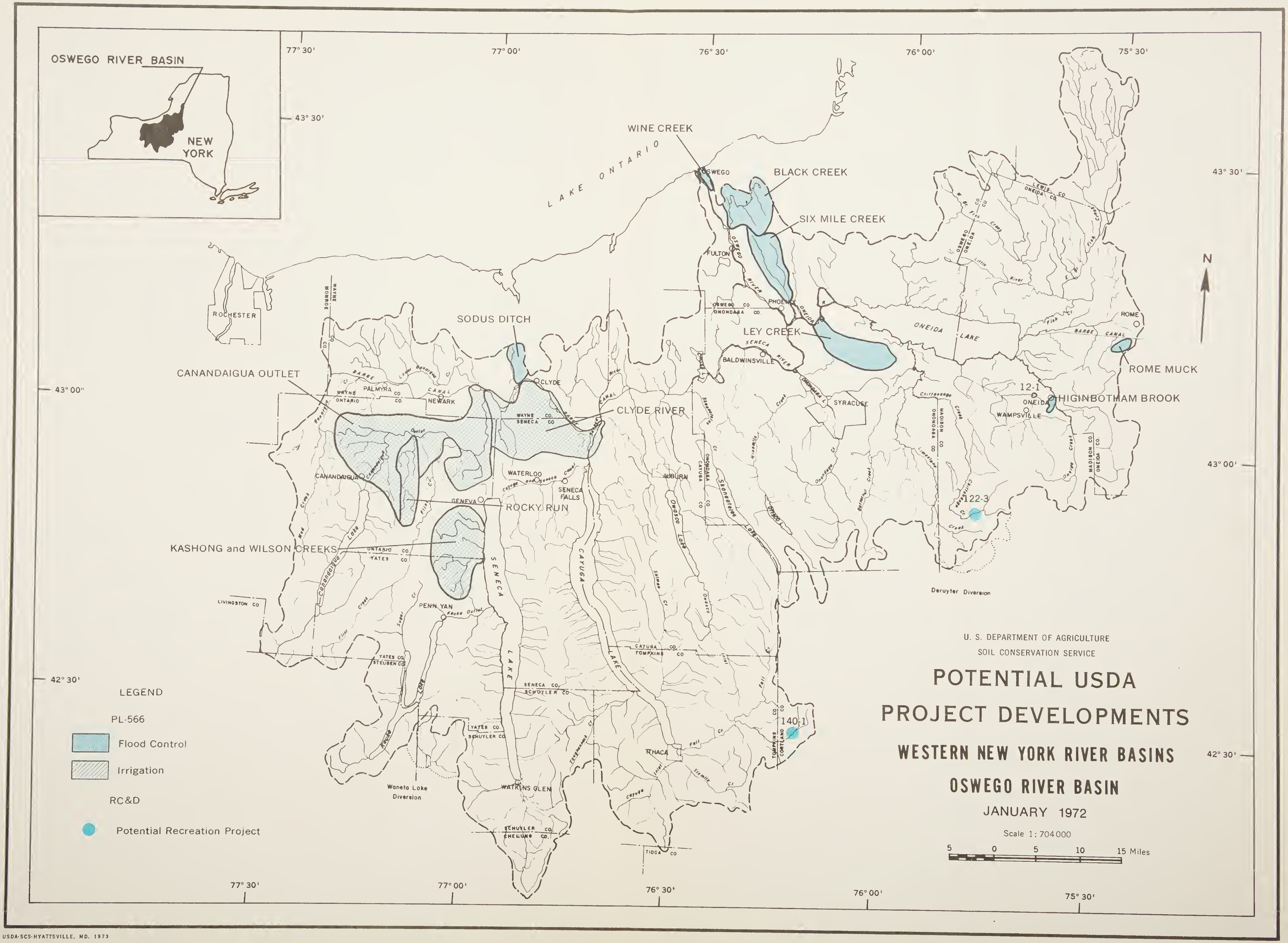
Land treatment measures are continually being installed through such programs as Public Laws 46 and 566, Cooperative Forest Management (CFM), and Resource Conservation and Development (RC&D).

Many problems are involved and it will take a long period of time to install all the needed treatment in the Basin. To expedite improvement in the quality of our environment, it is recommended that practice installation be accelerated.

Accelerated land treatment is expected to be carried out on most of the land in the Flint Creek watershed and the six other potential upstream watershed projects under PL-566 authority. An effective program in other areas must be accomplished through going cooperative programs.

Technical assistance for the establishment of land treatment practices is provided through such agencies as the Soil Conservation Service, the Forest Service, and the New York State Division of Lands and Forests, and the Cooperative Extension Service. Cost-sharing on land treatment practices can be provided through programs administered by the Agricultural Stabilization and Conservation Service.

Soil and water conservation districts can coordinate the application of land treatment practices according to the plan developed by the landowners to meet their objectives and the needs of the land.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE 8.1

All recommended programs are designed to help use each acre of land within its capabilities and treat it according to its needs. The conservation practices most extensively needed on agricultural lands include stripcropping, diversions, ponds, grade stabilization structures, drainage measures, land conversion, and critical area planting.

Under the Cooperative Forest Management Program (CFM) about 18 percent of the Basin's forestry needs could be met through the Early Action Program. Funding of the CFM Program at its authorized level, and the installation of forestry measures as an integral part of all federal impoundment projects will result in the installation of additional forestry measures. Projected accomplishments under the Early Action Program on private, non-industrial forest lands are 2,000 management plans, 5,000 acres of erosion control, 3,600 acres of grazing control, 22,600 acres of planting and seeding, 43,000 acres of planned harvest, and 41,300 acres of timber stand improvement.

Needed and recommended land treatment and costs by land use for 1980 are shown in Table 8.1. Details of the existing problems can be found in Chapter V. Recommended measures will retard runoff, reduce erosion and improve the quality and quantity of the products grown.

TABLE 8.1 - COST SUMMARY FOR LAND TREATMENT RECOMMENDED FOR DEVELOPMENT BY 1980 IN THE OSWEGO RIVER BASIN, NEW YORK

Land Use	Acres to be treated	Estimated Cost $	Funds Available Under Current Cost-sharing Programs	Additional Funds Needed for Accelerated Programs
Cropland	178,930	13,971,900	7,228,000	6,743,900
Pasture	43,350	1,970,200	1,020,000	950,200
Forest	115,500	9,308,000	4,823,000	4,485,000
TOTAL	337,780	25,250,100	13,071,000	12,179,100

Opportunities exist throughout the Basin in the field of forest products marketing and utilization. Greater marketing assistance to the landowner and better markets would make him aware of the true worth of his products and provide a greater incentive to improve his forest stands. The small forest landowner cannot be expected to efficiently manage his forest land for future crops of quality material unless market incentives are provided. The above services could be performed through the establishment of a forestry cooperative similar to the "Timber Development Organization" which exists in Delaware, Otsego, Chenango, Broome, and Schoharie Counties.

Watershed management is a prime consideration on the Hector Land Use Area. Streamflow quantity, distribution and quality from these lands are of major concern to the Forest Service. Research findings from forested watersheds throughout the country provide information on the effects of various management practices on hydrologic behavior in forest areas. Findings from these watersheds provide opportunities for upland pollution control, and land treatment practices which will improve watershed conditions. Integration of the Forest Service effort with that of local governments and/or private landowners will result in measurable improvement in water quality, quantity, and distribution of streamflow. For more detail on opportunities for development on the Hector Land Use Area, see Appendix D.

Projects Currently Being Planned

Flint Creek is the only watershed in the Basin which is currently in the planning phase of the PL-566 program. The primary watershed problem is the frequent flooding of highly developed muckland used in the commercial production of vegetables. Associated damages to farm ditches, tile, machinery, and supplies are also very significant. A second but major objective is to develop a dependable supply of water for irrigation.

The key flood of October 1955 caused an estimated $241,700 in direct damages to 800 crop acres. Average annual damages to crops including discounted damage to expected future development is estimated at $118,300.

Acceleration of land treatment measures, one floodwater retarding structure, one multipurpose floodwater retarding and irrigation structure, two drop structures, three water level control structures and 22.3 miles of channel improvement are proposed. The average annual cost of the project is $300,300 and the average annual benefits which will accrue are $532,400. This gives a benefit to cost ratio of 1.8:1.0.

Projects Identified in this Study

Seven potential PL-566 projects were identified. The total cost of these projects is 4.4 million or 324,550 annually. Average annual benefits expected are $515,200, giving a benefit to cost ratio of 1.7:1.0. These multipurpose projects would provide flood control, irrigation, drainage and recreation. See Figure 8.1.

The following discussion is a summary of these justified projects. More detail can be found in Table 8.2 and Appendix B.

Higinbotham Brook in Watershed No. 12

The purpose of this project would be to provide flood protection primarily to urban properties within the city of Oneida. Site 12-2 is recommended to control this flooding.

The total installation cost of the single purpose floodwater retarding structure is estimated at $153,000. Annual cost of $8,770 and annual benefits of $17,270 result in a favorable benefit to cost ratio of 2.1:1.

Mud Creek in Watershed No. 88

The Mud Creek project will provide flood protection to 140 acres of muckland with a dike and pumping system. A diversion will carry the upland runoff away from the project.

Total installation cost of the project is estimated at $239,200. Annual cost of $19,310 and annual benefits of $21,210 result in a favorable benefit to cost ratio of 1.1:1.

Rome Muck in Watershed No. 127

The purpose of the Rome Muck project would be to provide flood protection, drainage outlets, and irrigation water for 620 acres of muckland. Replacing the railroad culvert and enlarging the channels will be necessary.

The total installation cost of the multipurpose project is estimated at $602,200. Annual cost of $41,980 and annual benefits of $90,890 result in a favorable benefit to cost ratio of 2.2:1.

Six Mile Creek in Watershed No. 426

The purpose of the Six Mile Creek project would be to provide flood protection to Beaver Meadow muckland, irrigation for these and other lands, and water-based recreation. Construction of site 426-3 and channel improvement on Bell Creek will be required.

The total installation cost of the project is estimated at $1,723,000. Annual cost of $131,250 and annual benefits of $264,600 result in a favorable benefit to cost ratio of 2.0:1.

Wine Creek in Watershed No. 433

The purpose of this project is to provide flood protection to approximately 385 acres of developed muckland. Channel improvement through the muckland and the outlets will be needed to provide this protection.

The total installation cost of the project is estimated at $285,700. Annual cost of $22,540 and annual benefits of $26,200 result in a benefit to cost ratio of 1.2:1.

TABLE 8.2 - COST AND BENEFIT DATA FOR STRUCTURAL DEVELOPMENTS RECOMMENDED EARLY ACTION (1980), OSWEGO RIVER BASIN, NEW YORK

WS No.	Project Area	No. Sites	Miles of Channel	Installation Cost 1/	Average Annual Cost	Average Annual Benefits	Benefit Cost Ratio	Area Benefited (Acres) Flood	Irrig.	Drainage	Purpose
	Currently Planned										
11	Flint Creek Watershed	2	22.3	4.949.300 3/	300,300 3/	532,400	1.8:1.0	2,575	3,380		FC, Irrig.
	Potential Projects Identified in this Study										
12	Higinbotham Brook	1		153,000	8,770 2/	17,270	2.0:1.0	Urban			FC
88	Mud Creek	Pump Plant		239,200	19,310 4/	21,210	1.1:1.0	140			FC
127	Rome Muck		6.1	602,200	41,980 3/	90,890	2.2:1.0	685	620	685	FC,Irrig.,Dr.
426	Six Mile Creek	1	4.1	1,723,000	131,250 3/	264,550	2.0:1.0	425	425		FC,Irrig.,Rec.
433	Black Creek		1.7	273,200	22,820 4/	26,600	1.2:1.0	400			FC
433	Wine Creek		5.2	285,700	22,540 4/	26,200	1.2:1.0	385			FC
454	Sodus Ditch		6.7	1,107,000	77,880 3/	89,730	1.2:1.0	3,000	4,000	3,000	FC,Irrig.,Dr.
Subtotal-Potential Projects		2	23.1	4,383,300	324,550	536,450	1.7:1.0	5,035	5,045	3,685	
	Resource Conservation and Development Projects										
122	Trib. of Chittenango Creek	1		1,839,000	103,300 2/	391,500	3.8:1.0				Rec., F&W
TOTAL - EARLY ACTION		5	32.1	11,171,600	728,150	1,460,350	2.0:1.0	7,610	8,425	3,685	

1/ Price Base: 1969 except Flint Creek - 1968 and Mud Creek - 1971
2/ Amortization over 100 years at 5 3/8 percent interest
3/ Amortization over 50 years at 5 3/8 percent interest
4/ Amortization over 25 years at 5 3/8 percent interest

Black Creek in Watershed No. 433

The purpose of this project is to provide flood protection to approximately 240 acres of developed muckland. Channel improvement on Black Creek through the muckland will be needed to provide this protection.

The total installation cost of the project is estimated at $273,200. Annual cost is estimated at $22,820 and annual benefits at $26,600 result in a favorable benefit to cost ratio of 1.2:1.

Sodus Ditch in Watershed No. 454

The purpose of this project is to provide flood protection drainage outlets, and irrigation water to more than 3,000 acres of agricultural land with high potential. Channel improvement is necessary on Melvin Brook and Sodus Ditch to carry out these purposes. Irrigation water can be pumped from the New York State Barge Canal.

The total installation cost of the project is estimated at $1,107,000. Annual cost at $77,880 and annual benefits at $89,700 result in a favorable benefit to cost ratio of 1.2:1.0.

Resource Conservation and Development Projects

Site 122-3 - The main purpose of this site is to supply recreational opportunities for the people of the Syracuse metropolitan area and the people in Chenango, Cortland, and Madison Counties. This site was selected because of its exceptional efficiency and its ability to provide for multipurpose use. The total cost is estimated at $1.8 million. Annual cost is $103,300 and annual benefits $391,500, giving a favorable benefit to cost ratio of 3.8:1.0.

Hector Land Use Area

Good opportunities exist on the Hector Land Use Area to further expand recreational facilities to keep pace with the increasing recreational demand. It is located in the center of the Finger Lakes Region and is in a strategic location in relation to the large urban centers of upstate New York such as Syracuse, Binghamton, Elmira, and Rochester. Table 8.3 shows the facilities which are recommended.

TABLE 8.3 - HECTOR LAND USE AREA RECOMMENDED EARLY ACTION STRUCTURAL PROGRAM
OSWEGO RIVER BASIN, NEW YORK

Type of Site	No.	Capacity	Estimated Cost $
Campgrounds	2	150	68,000
Ground Camping Area	1	100	15,000
Picnic Grounds	7	150	40,000
Self-Guided Interpretive Trails	2		3,000
Trails	7 (miles)		7,000
Impoundments (Fishing)	5		25,000
Access Roads and Parking Areas (for development sites)	5		24,000
Visitor Information Station	1		15,000
TOTAL	25	400	197,000

The increase in recreation use has been dramatic. Since 1960, use has increased 24 times (Table 8.4). Based on a straight line projection of use increasing on the Hector Land Use Area at the present rate, the use by 1980 would be 75,000 visitor days.

TABLE 8.4 - PAST AND PROJECTED VISITOR DAYS FOR THE HECTOR LAND USE AREA, OSWEGO RIVER BASIN, NEW YORK

Activity	Past 1960	Past 1970	Projected 1980
Camping	100	11,400	25,000
Picnicking	400	2,500	9,000
Hiking and Horseback Riding	100	3,000	5,000
Snowmobiling	0	3,300	15,000
Hunting	800	9,900	14,000
Fishing	100	2,000	4,000
Other	100	4,300	8,000
TOTAL	1,600	38,400	80,000

LONG RANGE (2020)

By 2020 the program of Environmental Education should be well established. People, more aware of their obligation to preserve our natural resources, will be willing to spend funds to improve the quality of the environment.

Four PL-566 projects with irrigation as their primary purpose were identified. In addition, two sites wih recreation potential were found in the RC&D project area. All are recommended for development under the long range program - between 1980 and 2020.

Land Resource Planning

Land use planning must be continued on a broad scale to assure the orderly and efficient development of the Basin. Planning should stress the preservation of aesthetics as well as conservation and development of land and water resources.

Land Treatment Measures

Land treatment needs on 1.7 million acres should be completed by 2020. This includes a land treatment program between 1980 and 2020 on 1.4 million acres. (See Table 8.5). Cropland treatment of 538,400 acres will include diversions, stripcropping, terraces, drainage measures and hedgerow removal. On the 150,800 acres of pasture, establishment and improvement of cover, drainage measures, fencing, and better management practices will be used.

Projected accomplishments under the recommended long range program on private, non-industrial forest lands consist of 1,100 management plans, 11,200 acres of erosion control, 15,200 acres protected from grazing, 65,800 acres planted and seeded, 155,400 acres of planned harvest, and 162,900 acres of timber stand improvement.

TABLE 8.5 - COST SUMMARY FOR LAND TREATMENT RECOMMENDED FOR DEVELOPMENT BETWEEN 1980 AND 2020 IN THE OSWEGO RIVER BASIN, NEW YORK

Land Use	Acres to be Treated	Estimated Cost	Funds Available Under Current Cost-sharing Programs	Additional Funds Needed For Accelerated Programs
		- - - - - - - - -	-dollars - - - - - - -	- - - - - - - - -
Cropland	538,420	35,340,300	30,586,000	4,754,300
Pasture	150,810	6,346,000	5,438,000	908,000
Forest	681,500	18,852,300	16,260,000	2,592,300
Total	1.370.730	60.538.600	52,284,000	8.254,600

Total cost of this program is $60.5 million, of which $22.1 million is a federal cost and $38.3 million is to be paid by local interests. These programs will meet all of the needs on crop and pasture land by 2020, but only 70 percent of the Basin's forestry needs since the amount of forest land is expected to increase and manpower and funding are not expected to increase proportionately.

Irrigation Projects Identified

Cost and benefit data and other pertinent information for the justified irrigation projects are found in Table 8.6, Appendix C and the following discussion.

Canandaigua Outlet

This project would supply irrigation water to 7,440 acres from three reservoir sites. Total cost of the project is $2,145,000. Water for augmentation to the Canandaigua Lake Outlet would also be available.

Clyde River

The two reservoir sites in this project could supply irrigation water to 2,600 acres and would also have water to augment the Barge Canal. The total project cost is estimated to be $1,145,000.

Kashong and Wilson Creeks

This project would supply irrigation water to 4,680 acres from two reservoirs and also include a recreation development. The estimated project cost if $1,809,000.

Rocky Run

The three reservoirs proposed in this project will supply irrigation water to 6,400 acres along with water for augmentation to the Canandaigua Lake Outlet. The estimated project cost is $1,663,000.

Resource Conservation and Development Projects

Two sites, 12-1 and 140-1, are recommended for development under the long-range program. These sites developed manimum feasible potential and would provide approximately 800 surface acres of water. Total cost for the two structures is $4.3 million. The benefit to cost ratio for the projects is 1.6:1.0.

The potential for the RC&D program is great for acceleration of going programs of resource conservation and development. This program is in the operations phase and in the future should be a major tool to assist in solving land and water conservation problems.

TABLE 8.6 - COST AND BENEFIT DATA FOR STRUCTURAL DEVELOPMENTS RECOMMENDED FOR LONG RANGE DEVELOPMENT,

OSWEGO RIVER BASIN, NEW YORK

WS NO.	Project Area	No. Sites	Installation Cost 1/	Average Annual Cost 2/	Average Annual Benefits	Benefit Cost Ratio	Area Benefited Acres 3/ Irrigation	Purpose
Irrigation Projects Identified								
437	Canandaigua Outlet	3	2,145,000	115,900	134,960	1.2:1.0	3,720	Irr. LFA
439	Rocky Run	3	1,663,000	89,870	110,840	1.2:1.0	3,190	Irr. LFA
441	Kashong Creek	2	1,809,000	97,760	313,200	3.2:1.0	2,340	Irr. Rec.
446	Clyde River	2	1,145,000	61,880	71,550	1.2:1.0	1,300	Irr. LFA
Subtotal - Irrigation		10	6,762,000	365,410	630,550	1.7:1.0	10,550	
Resource Conservation and Development Projects								
12		1	644,000	34,800	45,000	1.3:1.0		Rec., F&W
140		1	3,622,000	195,700	315,000	1.6:1.0		Rec., F&W
Subtotal - RC&D		2	4,266,000	230,500	360,000	1.6:1.0		
TOTAL LONG RANGE		12	11,028,000	595,910	990,550	1.7:1.0	10,550	

1/ Price Base: 1969.
2/ 100-year life at 5 3/8 percent interest rate.
3/ Represents one-half of gross irrigable area.

IMPACTS OF PROGRAM PROPOSALS

Present trends indicate that there will be continuing rapid urban and industrial expansion in the Basin, particularly in the areas associated with present urban and industrial centers. Land areas devoted to agriculture will decline with production levels being maintained by improved methods and efficiencies. Recreational development, including public and private facilities to satisfy growing public demands will expand rapidly along with expansion in vacation and seasonal homes in the rural areas of the Basin. Forest land is projected to remain relatively constant in acreage with some areas shifting from land to forest and some from forest to residential or recreational use.

These probable developments will influence the environmental quality of the Basin favorably or adversely depending on the success of efforts made to plan and install them with proper safeguards. Thus, the concept of using land according to its capability and treating each acre according to its needs must not only be a guiding principle for agricultural and forest use but must be expanded to all lands. The continuing USDA programs for agricultural and forest lands plus expanded programs affecting urban and recreational developments can have a pronounced impact on managing the resources of the Basin to meet the needs of the expanding population while continuing to improve its environmental quality.

The installation of the thirteen project developments could provide an estimated $928,000 in annual net benefits to national efficiency. This could result in an annual regional effect at almost 2 billion dollars.

HYDROLOGY

The hydrologic conditions in the Basin during the projected period will be influenced by the many activities causing land use changes with conflicting results. USDA programs will be effective in bringing about an orderly improvement in hydrologic conditions by continuing to influence use and management of agriculture and forest land. In those areas involved in urban expansion, they can be effective in minimizing the detrimental hydrologic effects of these activities by assisting in land resource planning for urban, recreational, and aesthetic development.

The greatest overall impact on hydrologic conditions of the forest land will result from the degree of protection and management given those lands. Based on the physiographic characteristics of the land occupied by forests and the expected results of the proposed forest land treatment measures, the hydrologic conditions of forest lands will be improved.

The greatest change or improvement is associated with re-established forest. Here blocks of land used for grazing or crops that either revert to forest naturally or are planted can reduce summer storm peaks and for some soils can help to improve low flows.

Urban developments usually have adverse effects on the hydrologic conditions. The expanding population demands for industrial, residential, and transportation facilities are hydrologically destructive in proportion to the area of impervious construction.

High rates of runoff are induced where roofs, streets, and parking lots prevent infiltration. Newly constructed industrial parks and shopping centers may cause large local increases in runoff, whereas, low-intensity housing with preserved trees and grass cover may cause only slight increases.

WATER QUALITY

Present water quality in upland streams is high. This quality is expected to be maintained and improved through better hydrologic conditions in both open and forest lands.

SEDIMENTATION

The programs of environmental education, land resource planning, and land treatment should have an important impact in reducing the amount of sheet erosion from both cropland and land undergoing urbanization. This will result in less sedimentation occurring at downstream locations. Aesthetics will improve with the elimination of erosional scars and streams will not have to carry the same loads, thus they will be clearer.

FISH AND WILDLIFE

In all watersheds studied as special projects, one of the objectives in project formulation was to come up with an alternative that would have little or no effect on fish and wildlife resources. Alternatives that would enhance fish and wildlife were sought. The projects formulated in all the Watershed Investigation Reports (Appendix B) will have little or no adverse effect on valuable fish and wildlife resources.

VEGETATION

The continuation of USDA sponsored programs will bring about improved vegetative cover on the farm and forest lands of the Basin. Croplands will have clean tilled crops largely on Soil Conservation Service Land, Classes I, II, and III lands with most other cropland used for hay. Vegetative cover can also be improved through proper grazing management of pastures and cropland grazed after harvest. These management practices will increase water intake into the soil and thereby help to reduce runoff. Proper forest management including the application of conservation practices such as continued fire protection, and protection from improper cutting and grazing will result in improved conditions of forest land.

ECONOMIC EFFECTS

The installation of the thirteen project developments could affect the regional economy as outlined in Table 8.7. This table also shows the annual net increase to national efficiency (the average annual benefit minus the average annual cost). The economic impact of these measures are individually useful depending on whether one is interested in project effects from a regional or national point of view.

TABLE 8.7 - NATIONAL AND REGIONAL BENEFITS OF THE PRINCIPAL USDA STRUCTURAL PROGRAM IN THE OSWEGO RIVER BASIN, NEW YORK

Proposed Project Development (Primary Purpose)	Annual Net Benefit to National Effic. (Primary Benefit)	Annual Regional Effect of Project Development	Installation Cost	Regional Effect of Proposed Installation
		-Thousand Dollars-		
Flood Control	250	500	3,852	7,704
Irrigation	254	508	6,762	13,524
Recreation	424	848	6,105	12,210
TOTAL	928	1,856	16,719	33,438

The criteria used to evaluate the effect of projects relative to national efficiency objectives are concerned only with the net value of the immediate products or services of the projects. The criteria used to evaluate the effect of the projects relative to regional development objectives are concerned not only with the immediate products or services of the projects, but also with the effect these changes in income have throughout the entire regional economy. It should be kept in mind that when national efficiency benefits and regional development benefits are defined in this manner, they are not additive.

In total, these projects could provide an estimated $928,000 in annual net benefits to national efficiency. To determine the regional impact of this increased economic activity, it is necessary to consider the multiplier effect. On the basis of guidelines developed by the Natural Resource Economics Division, Economic Research Service, and other studies, a multiplier of 2.0 has been utilized for this Basin. This could result in an annual regional effect of almost 2 billion dollars.

In addition to the annual figures, there will be $16.7 million in installation expenditures during the period of project construction. The regional effect of this would again be influenced by the multiplier effect, resulting in an increase in regional economic activity of over $33 million dollars during the construction period.

While most of the projects have multiple-purpose possibilities, it is perhaps most useful to discuss the impact of the projects by their primary purposes. For each major purpose, the benefits to national efficiency objectives will be described, and the impact on the regional economy will be estimated.

Five of the projects would provide flood protection and drainage to high value cropland and one project is for urban protection in Oneida. There are four projects which are primarily for irrigation water supply with side benefits from low flow augmentation and recreation. Three are single-purpose recreation projects.

FLOOD PROTECTION

There is one project whose sole justification is flood control. This is the Higinbotham Brook project, designed to control flooding within the city of Oneida. The regional impact of this construction would be over $300,000 with an average annual net benefit to national efficiency of an estimated $9,250 and an average regional impact of twice this.

Six of the projects are designed with both flood protection and water regulation through drainage and/or irrigation in mind. They would protect over 1,700 acres of very valuable muckland, along with 3,000 additional acres of high potential agricultural land. These projects would provide an increase to national efficiency of over $240,000 annually, with an annual regional impact of almost one-half million dollars. The regional effect of construction activities would be almost 7.4 million dollars.

IRRIGATION

The ten reservoirs proposed in these four projects designed with irrigation as the primary purpose would provide water to over 21,000 acres. The total cost of the four projects is estimated at 6.8 million dollars, with an annual regional effect of over $508,000. The annual net benefit to national efficiency would be over $254,000.

RECREATION

Recreation projects could provide 283,000 annual visitations valued at $424,000 annually. The regional effect is estimated at almost $850,000 with an additional regional effect of over 12 million dollars during the period of project construction.

Installation of recreational developments on the Hector Land Use Area, as shown on page 8.8 are expected to generate over 80,000 visitor days annually by 1980 (Table 8.3). Annual expenditures in local communities by visitors are estimated to exceed $200,000 for the same time frame.

CHAPTER IX

COORDINATION AND PROGRAMS FOR FUTURE DEVELOPMENT

Many of the Basin's problems and needs identified in this report cannot be solved through existing USDA programs. Other means such as existing state, county, and town programs must be utilized or, in many cases, established in order to solve these problems.

GENERAL

It is the responsibility of the Eastern Oswego, Cayuga Lake, Chemung River and Wa-Ont-Ya Regional Water Resources Planning Boards, assisted by the Department of Environmental Conservation, and other cooperating agencies to coordinate the development of a comprehensive water and related land resource plan. The plan will include consideration of all problems as well as the ways to implement the solutions.

Many agencies will provide reports and technical data to the boards in areas of special concern. This report represents the input of the USDA and details the extent to which the USDA could participate in the development of the water and related land resources of the Oswego River Basin. As an interim report, it is provided as an aid to the overall formulation which will be carried out by the four boards.

The plan developed by the boards will contain recommendations as to the best alternatives to meet the needs and solve the problems. Recommendations for implementation will show the extent which the USDA will be asked to participate.

If this participation extends beyond the scope of existing authorities, the USDA could prepare a special report and request authorization for additional work.

CHANGES NEEDED IN CONGRESSIONAL POLICY AND AUTHORIZED PROGRAMS

PUBLIC LAW – 566

At the present time, projects applicable to PL-566 are those potential developments which have flood control or irrigation as the primary purpose. However, present administrative constraints limit the program to projects having flood control as the primary purpose.

This constraint severely limits the concept of total resource development of an area. In the Oswego River Basin, with its more than 21,100 acres of irrigable land in four potential project areas, severe hardships may be created as these farmers attempt to compete with growers in other areas. Quality and quantity of the products could be inferior to those which come from irrigated areas.

This constraint severely limits the concept of total resource development of an area. In a very practical way, irrigation suffers in competing for inclusion in regional water development plans due to the federal financial assistance available for other competing uses. Inclusion of

irrigation in these plans would enhance the ability to develop existing water and soil resources to optimize their productivity.

New York State is typical of many eastern states in that its agricultural sector is under pressure from urban growth. A healthy agricultural sector is important in maintaining a diversified and balanced economy. Irrigation can play an important role in maintaining a viable farm sector and providing a stable base for agricultural supply and marketing businesses.

Irrigation in New York is used primarily on high value fruit and vegetable crops. These crops require expensive inputs for their production and a well developed marketing and processing sector. The benefits of a strengthened farm economy are, therefore, spread much beyond those involved directly in producing the crops. Irrigation allows more efficient use of other production resources and may permit meeting projected needs for food and fiber using less resources than would otherwise be possible. In addition to increased and more stable quantity of output, the quality can be expected to improve with irrigation, providing processors and consumers with a steady supply of high quality produce.

Irrigation in New York has already developed to the point where there are few remaining sources of irrigation water that can be developed on an individual basis. Group action will be necessary in most cases. Given the distribution of benefits beyond the direct beneficiaries, outside financial assistance appears necessary and justified for total resource development to be accomplished.

COOPERATIVE FOREST MANAGEMENT PROGRAM

There is a need for expansion of existing cooperative programs to allow for the provision of technical assistance in urban and community forestry.

Assistance of this type would differ considerably from the traditional multiple-use management approach by emphasizing environmental quality. This assistance would be aimed at helping the people that live in urban and community areas to protect and improve the natural environment both in present and future urbanizing areas. It would be designed to protect, restore and enhance urban environmental values that are dependent upon the culture of trees and associated woody plants.

Technical assistance, cost-sharing for approved cultural practices, education, training and research should be elements of the expanded program.

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM

The Rural Environmental Assistance Program which has been effective in promoting good forestry and agricultural practices needs to be expanded. To meet the estimated land treatment needs, an additional $600,000 per year funding is needed. With more funds available and the possibility of 100 percent federal financing of critical area work, a larger amount of needed conservation land treatment work could be accomplished by this program.

MUNICIPAL WATERSHED FORESTRY ASSISTANCE PROGRAM

A program is needed to provide communities and watershed managers with planning and consultive services related to the protection, restoration and productivity of municipal watersheds. This program should provide for technical assistance, cost sharing for approved cultural practices, credit, education, training, and research.

SELECTED REFERENCES

Coleman, E. A., New York, Ronald Press, Co., 1953. *Vegetation and Watershed Management.*

Developing and Managing the Water Resources of New York State: New York State Department of Environmental Conservation, Division of Water Resources, Albany, New York 1967.

Journal of Soil and Water Conservation Vol. 19, No. 1, 1964. *Water quality and Soil Erosion as Affected by Logging in Steep Terrain.*

Lockwood's Directory of Paper and Allied Trades.

Massachusetts Agricultural Experiment Station, 1963. *A report on the Survey of Forest Owner Characteristics and Attitudes in Berkshire County, Massachusetts.*

Needs for Fish and Wildlife - Oswego Basin. A report presented at the Oswego River Basin Environmental Quality Workshop April 8, 1970, Eisenhower College, Seneca Falls, N. Y. by Udell B. Stone, Associate Aquatic Biologist, New York State Department of Environmental Conservation.

Olsen, Gerald W., Ernest E. Hardy and Charles S. Hunt, *The Oswego River Basin: Inventory of Agricultural Production.* A. E. Res. 275, Dept. of Agricultural Economics, New York State College of Agriculture, Cornell University, Ithaca, New York, January 1969.

Olsen, Gerald W., Ernest E. Hardy and Charles S. Hunt, *The Oswego River Basin: Projections of Agricultural Production.* A. E. Res. 276., Dept. of Agricultural Economics, New York State College of Agriculture, Cornell University, Ithaca, New York, January 1969.

Soil Conservation Service *Land Resource Regions and Major Land Resource Areas of the United States.* United States Department of Agriculture Handbook #296. December 1965.

Stout, Neil J., 1958. *Atlas of Forestry in New York.*

USDA-Forest Service. *1968 Forest Fire Statistics.*

USDA-Forest Service, Forest Resource Report No. 17, 1967. *Timber Trends in the United States.*

USDA-Forest Service, 1963. *Hardwood Log Grading.*

USDA-Forest Service, Miscellaneous Publication 941, 1963. *The Economic Importance of Timber in the United States.*

U. S. Department of Commerce, Bureau of Census. *1963 Census of Manufacturing.*

Water-Oriented Outdoor Recreation in the Lake Ontario Basin. U. S. Department of Interior, Bureau of Recreation. October 1967.

Water Pollution Problems and Improvement Needs, Lake Ontario and St. Lawrence River Basins. U. S. Department of Interior and New York State Department of Health, June 1968.

Wolman, M. Gordon, *Problems Posed by Sediment Derived from Construction Activities in Maryland;* page 125, January 1964, Maryland Water Pollution Control Commission.

Young, Robert E., Deputy Commissioner, Conservation Department; Vollmer Ostrower Associates; Arnold H. Vollmer, Partner-in-Charge; Marjean McConnell and John A. Hauptman, Project Directors; Margot Wellington, Chief of Research; Melvyn M. Ettinger, Production. *New York Statewide Comprehensive Outdoor Recreation Plan, 1965.*

PRELIMINARY UPSTREAM

RESERVOIR STUDIES

Appendix A

(Published as a separate book)

SPECIAL PROJECT STUDIES

UNDER

USDA PROGRAMS

Appendix B

United States Department of Agriculture Report

Western New York River Basins

Oswego River Basin

Prepared by

United States Department of Agriculture

Soil Conservation Service   Economic Research Service   Forest Service

March 1971

OSWEGO RIVER BASIN - APPENDIX B

SPECIAL PROJECT STUDIES UNDER USDA PROGRAMS

Contents

INTRODUCTION

More than 280,000 acres of agricultural land suffer from inadequate channels to provide outlets for drainage and floodwater. Historical records, local interviews, and hydraulic calculations indicate flooding in the Oswego River Basin is taking its toll from the overall economy. Because these areas are scattered throughout the Basin, total monetary damage determinations are difficult to make.

The total average annual damage is estimated to exceed $989,600. This includes damages studied by the Army Corps of Engineers in the areas of (1) lakeshore damages - $185,000 and (2) river front damages - $229,000. The remaining floodwater damages of $575,600 are found in upstream areas studied by the U.S. Department of Agriculture (USDA).

Most of the damages in areas studied by the USDA can be attributed to agricultural flooding.

Those areas studied in detail are the Barge Canal, Fall Creek in Cortland and Tompkins Counties, Mud Creek in Ontario County, Red Creek and Sodus Ditch in Wayne County, Wine Creek, Black Creek and Six Mile Creek in Oswego County, Limestone and Butternut Creeks in Onondaga County, and Rome Muck in Oneida County. Flint Creek in Ontario and Yates Counties was studied under Public Law 566 authorization prior to the Oswego River Basin Study. Details of this project can be found in the Flint Creek Watershed Work Plan developed by the Ontario, Yates, and Steuben Counties Soil and Water Conservation Districts.

Flooding in upstream areas occurs along approximately 125 miles of stream and inundates about 7,500 acres of land. Damages total about $181,900 annually. This does not include $129,000 average annual damages in the Flint Creek Watershed. In addition, over 29,000 acres flood along the Barge Canal causing damages in excess of $123,000 annually. This acreage is mostly muckland which has great production potential if the flood threat were removed.

Urban flooding was studied in detail in the following areas: Higinbotham Brook in Oneida, Ley Creek at Syracuse, Egypt Creek at Dryden, Sucker Brook at Canandaigua, Sucker Brook at Penn Yan, and a small stream at Union Springs.

Total damages amount to about $127,900 annually in the above areas. Minor damages do exist at scattered locations throughout the Basin, but are too small for evaluation purposes.

From these studies, seven potential project areas were identified: Higinbotham Brook, Mud Creek, Rome Muck, Six Mile Creek, Wine Creek, Black Creek, and Sodus Ditch. Average annual damages of $195,700 were found on over 4,700 acres. See Table B.1 for other information.

In addition to the flood prevention aspects of these projects, other problems and opportunities were studied. In all cases except Higinbotham Brook, multiple purpose projects were proposed. Drainage, irrigation, and recreational problems and solutions were studied and incorporated in the projects where the need was evident.

PROCEDURES

SELECTION OF PROJECTS FOR STUDY

At the beginning of the study, a field reconnaissance was made with field personnel of the Soil Conservation Service and New York State Division of Water Resource personnel to determine those areas in the Basin which have a concentration of water and related land resource problems such as flooding, poor drainage, lack of recreational opportunities, or a shortage of irrigation water.

These selected watersheds were investigated in sufficient detail to determine the potential that exists in these watersheds to help solve the problems and needs through PL-566 type watershed projects.

TABLE B.1 - FLOODWATER DAMAGES STUDIED IN THE OSWEGO RIVER BASIN

County	Location	Area Flooded (Acres)	Average Annual Damage (Dollars)	
URBAN FLOODING				
Madison	Higinbotham Brook	10	16,000	
Onondaga	Ley Creek	200	98,600	
Tompkins	Egypt Creek		4,000	
Ontario	Sucker Brook (Canandaigua)	100	8,300	
Yates	Sucker Brook (Penn Yan)	10	1,000	
Cayuga	Union Springs	5	--	
SUBTOTAL - Urban				127,900
AGRICULTURAL FLOODING				
Oneida	Rome Muck	650	41,000	
Wayne	Sodus Ditch	550	37,000	
Onondaga	Mud Creek	140	13,800	
Oswego	Six Mile Creek	450	34,000	
Oswego	Black Creek	250	26,700	
Oswego	Wine Creek	400	23,000	
Madison	New Woodstock	300	8,000	
Tompkins	Fall Creek		6,600	
Ontario	Mud Creek	550	3,000	
Onondaga	Limestone Creek	550	1,400	
Onondaga	Butternut Creek	550	1,200	
Wayne	Red Creek	250	--	
SUBTOTAL - Agricultural - Study Areas				195,700
Flint Creek			129,000	
Barge Canal			123,000	
SUBTOTAL - Agriculture - General				252,000
TOTAL - DEPARTMENT OF AGRICULTURE				575,600
AGRICULTURAL AND URBAN				
Lake Shore			185,000	
River Front			229,000	
TOTAL - CORPS OF ENGINEERS				414,000
GRAND TOTAL - OSWEGO RIVER BASIN				989,600

Where it was determined that a project was potentially feasible and should be initiated within 10 to 15 years, a watershed investigation report was prepared. When there was no feasible project under existing criteria, a watershed evaluation report was written. In the Oswego River Basin, seven watershed investigation reports and 12 watershed evaluation reports were prepared.

These reports were prepared to enumerate the needs and problems, to propose solutions, and to evaluate costs and benefits. This information can help the three regional water resources planning boards develop their water resource plans. Further, other interested local organizations will find the report useful in initiating the development of the project in their areas.

INVESTIGATION AND ANALYSIS

The team approach was used in examining the selected watersheds. This provided a more complete and coordinated effort during the study. Disciplines involved and their approach included:

GEOLOGIST

Geologic investigations of the watersheds consisted of map studies and field investigations. Structure sites and channels were appraised by examining the geologic map of New York State and the appropriate county soil survey report. This information was field checked and occasional soil borings were made with a hand auger to obtain additional information.

A report was prepared indicating site conditions which would need attention in the design stage. Items which would affect the cost, such as rock excavation, permeable sands and gravels, soft foundation, and lack of borrow were evaluated with the engineer and a treatment cost established.

Erosion and sedimentation in the watershed was observed to determine if any serious problems existed which should be considered in the project.

ENGINEER

Structural measures designed in the project studies generally are either water-impounding structures or channel improvement. All designs were based on Soil Conservation Service criteria.

The designed height of the dams and the pool size were governed by one or more of the following factors: (1) the storage volume needed to retard a 100-year frequency storm without discharge occurring in the emergency spillway, (2) the selected beneficial storage volume, (3) the estimated storage volume for 100-year sediment accumulation, (4) limiting topographic or geologic features, (5) allowable release rates, and (6) critical land rights elevations.

Embankment volumes were computed from surveyed centerlines or centerlines plotted from USGS topographic maps. Stage-storage data was computed from USGS 7 1/2 minute topographic maps.

Channel designs were based on surveyed cross-sections of the channel and distances obtained from the USGS 7 1/2 minute topographic maps. Capacity of the channels was based on the requirement to keep a design frequency storm within banks or to provide a drainage outlet.

Unit costs were used in estimating the cost of the structural measures based upon data compiled from recent construction work in New York.

BIOLOGIST

Consideration of the fish and wildlife and recreation aspects was given to all project watersheds by the biologist in cooperation with the New York State Department of Environmental Conservation, Division of Fish and Wildlife. The main role of the division was to supply information concerning the classification of the streams within project areas, and the existing fishery resources.

With this information, a field reconnaissance was made by the SCS biologist. Present conditions of the watershed in regards to the fish, waterfowl, and upland wildlife habitat were recorded. Potential sites for fish, wildlife and recreation areas were examined.

Project alternatives were evaluated to see what affect they would have on the fish and wildlife resources of the area. Enhancement opportunities and potential damages were appraised in order to properly evaluate project benefits.

ECONOMIST

The selected watersheds were investigated to determine land use, cropping patterns, and damage potentials for agricultural and nonagricultural uses of the flood plain areas. Field examinations, interviews, historical events, or synthetic methods were used to obtain data to develop estimates. Average land values for land rights were checked for adequacy. Pertinent trends were identified where possible.

Project benefit evaluations were based on material prepared by other members of the team.

Adjusted normalized prices and crop budget data were taken from the *USDA Economics Guide* and Regional Technical Service Center Technical Notes where applicable. On muckland truck crops, the net income method was used to determine damages and benefits.

Costs were allocated to purposes and compared with benefits to determine project feasibility. Alternative measures were considered to find the best solutions to the problems encountered.

HYDROLOGIST

Hydraulic and hydrologic studies were conducted where expressed water problems existed in agricultural or urban areas.

Channel and valley cross-sections were surveyed to USGS datum to define flow areas and to obtain elevations of physical developments in the flood plain. Stage-discharge relationships for each section were computed by use of a water surface profile computer program.

Frequency-discharge relationships were obtained using USGS gage records where available. The frequency-discharge relationships were based on the annual series and determined by the Log Pearson Type III distribution. For those areas where gage data was not available, procedures outlined in SCS-TP-149, *A Method for Estimating Volume and Rate of Runoff in Small Watersheds*, was used for drainage areas less than 2,000 acres. For larger areas, a computer program, *Project Formulation - Hydrology SCS-TR-20*, was used.

The effects of proposed structural works of improvement were analyzed by determining the reduction in peak flow through damage reaches.

Soil Conservation Service policy and procedures were used in all computations.

FORESTER

Field surveys of the watersheds were made to obtain information on the hydrologic condition of the forest land, and the reasons for the present hydrologic conditions. This information serves as the basis for forest resource problems and needs in rural and urban areas. The following information was obtained as it is applicable to each individual watershed:

1. A brief description of the present forest land based on its location, percent in forest cover, ownership pattern, condition, estimated probable trends in uses, forest industries, and markets.

2. The watershed problems and needs:

    a. Determine the present forest hydrologic condition, the cause and what effect it has on runoff, erosion and sediment.

    b. Determine if flooding is damaging forest land or interfering with forest operations by undermining streambanks, destroying logging roads and bridges, destroying vegetation or drowning of vegetation from prolonged inundation.

    c. Determine if erosion and sedimentation are damaging forest land or interfering with forest operations through gullying or erosion and sedimentation, preventing natural establishment of trees on critical areas.

3. The physical potential for meeting needs:

   a. The potential for the forest land to improve hydrologically.

   b. The area of forest land that will need treatment to reach the potential.

   c. Brief statements on potential sites for forest recreation and wildlife habitat development on public and private lands.

4. Under Works of Improvement for Potential Development, determine:

   a. The applicable land treatment and protection measures needed such as fire control, tree planting, erosion control, woodland grazing control, hydrologic cultural operations (TSI, and harvest cutting), critical area stabilization, and forest land drainage.

   b. The basic public facilities for recreation (if information is easily obtainable).

5. Effects and Economic Feasibility of Potential Development:

   a. Discuss the impact that additional facilities (impoundments) will have on forest land.

REVIEW

In order to provide the maximum protection with the least costly program, all plans were formulated by the team approach. The team members carefully review the plans and the report is distributed for review to other USDA agencies, Soil Conservation Service field personnel, and those staff members who work on allied programs. This procedure serves to get the best possible report and to keep others abreast of work being accomplished under River Basin Programs.

USE OF REPORTS

These reports are intended to be a summary of all pertinent information available for a particular problem area. The compilation of the information and orderly presentation provides a report which can be used in a request for planning authorization under the Public Law 566 program. It also will provide a useful tool to the regional water resources planning and development boards who are preparing a comprehensive plan for the orderly development of the water resources of the Oswego River Basin.

HIGINBOTHAM BROOK WATERSHED INVESTIGATION REPORT

CNI WATERSHED NO. 12

Western New York Type IV River Basins

Oswego River Basin

Madison County, New York

June 1970

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service   Economic Research Service   Forest Service

HIGINBOTHAM BROOK WATERSHED INVESTIGATION REPORT

CNI WATERSHED NO. 12
Oswego River Basin
Madison County, New York

June 1970

THE WATERSHED IN BRIEF

Higinbotham Brook, CNI Watershed No. 12, is located in the city of Oneida, Madison County, New York and has a drainage area of approximately 1,000 acres. It drains approximately 640 acres of land south of New York State Route 5, with a water course approximately three-fourths mile in each of two forks joining just north of Route 5. Then, proceeding through twin 4.5 foot diameter culverts under the athletic field of the senior high school, it drains an additional 400 acres of idle and urban land. It passes through a system of culverts and flumes approximately 3,000 feet in length across the main residential district of the city of Oneida, (1960 population 11,677), and into Oneida Creek, which flows northerly and empties into Oneida Lake. It lies entirely within Land Resource Area L-101, the Ontario-Mohawk Plain of the Lake States Fruit, Truck, and Dairy Region.

The soils of the upper watershed vary from a well drained to somewhat poorly drained Lairdsville-Lockport soil association formed on glacial tills derived from shales. On the flatter lands along the northern portion of the watershed, the soil association is Galen-Junius-Arkport, moderately well to well drained fine sandy loams developed on deposits of glacio-lacustrine origin. Between these two associations lies a narrow band of Wampsville soil association; a well drained soil with reddish, clayey subsoil over gravel developed on loose, permeable outwash gravel of glacial origin.

A major portion, 37 percent of the watershed is now in urban use. Land use on the sloping area to the south of Route 5 has been changing from primarily grassland agriculture to suburban housing development. North of the high school there has not been appreciable change in the dense urban area over the past 20 years, nor in the idle land along the tributary from the west and north of the railroad. Development is increasing between the railroad and Route 5 west of the high school.

Agricultural land use in the watershed is in support of dairy. Eighteen percent of the land is in cropland having a rotation of two years of corn, oats, and four years hay. Dairy cows pasture "native" grasses on 14 percent of the watershed.

The drainage area is 8 percent forested with most of the forest land in small woodlots. All of the forest land is privately-owned with the exception of 5 acres around the Baker Reservoir which is owned by the city of Oneida. The forest land is predominantly hardwood. Principal forest types are northern hardwoods and ash-elm-red maple. There are several small softwood plantations in the upper part of the watershed.

A golf course south of Route 5 occupies 6 percent of the land and another 8 percent is idle.

WATERSHED PROBLEMS AND NEEDS

The principal flooding problem has been in the dense urban area downstream of Sylvan Street. Flooding has also restricted development west of Sylvan Street. Some flooding occurs at the Seneca Street grade school located between Franklin and Seneca Streets, at the entrance to the pipe conduit under the school yard, and at the culvert under the railroad.

The dollar value of damage that occurred from the June 1958 flood, estimated to be a 20-year event, was $26,450. Flooding occurred primarily to cellars, lawns, and gardens. The average annual value of these urban area damages is estimated to be $16,000.

There is no known agricultural flood damage of any consequence.

Sediment is a recognized problem in the watershed. Deposition occurs in Higinbotham Brook just south of Route 5, just upstream from the high school, and at Sylvan Street. Cost figures obtained from the city engineer indicate that about $200 per year is spent by the city of Oneida for sediment cleanout. Fine sediments are carried out of the watershed into Oneida Creek.

Most of the damaging sediment comes from the high raw streambanks of the deeply incised east fork of Higinbotham Brook. These soft shale banks weather rapidly and the shale breaks down into a fine material which is transported by the stream.

Sheet erosion plays a minor role in contributing to the sediment damage in this watershed and is not considered a problem in land management or topsoil loss.

There is potential for more than the moderate amount of sediment already derived from urban facilities during construction periods. Urban expansion is expected to continue which makes the resulting increased rate of runoff and sediment of critical concern.

This urban and suburban expansion of the city of Oneida could have a deteriorating effect on the natural environment unless adequate land use planning is provided. In densely populated areas, vegetation grows under extremely adverse conditions. Man-made structures and pollution provide the greatest problem and adverse conditions. In addition, serious problems - environmental, social, and economic in nature - are created by the expansion of the city into the rural countryside. These problems relate to the retention of open space, changing land values, taxation, and dislocation of rural-based enterprises.

Despite the projected urban expansion and population growth, local government officials do not have, nor expect to have, a shortage of municipal or industrial water.

There is some interest, by the residents of Oneida, in incorporating recreation (swimming, boating), in a floodwater retarding structure. Fishery resources of the watershed are negligible.

The present unurbanized portions of the watershed provide some upland game habitat which will decrease as urban development continues.

PHYSICAL POTENTIAL FOR MEETING NEEDS

This is a watershed where three tributaries combine just upstream of the main urban damage center. The entire drainage area discharges through a residential area of Oneida where the brook flows through numerous culverts and sections of closed conduits east of Sylvan Street. This system has a capacity of approximately 100 cfs without overbank flow.

The urban area east of Sylvan Street is an area of high and rapid runoff from streets, roofs, etc. There is no way of significantly reducing the runoff characteristics from this area. The only possible major solution to convey the upland water through the urban areas would be to increase the channel capacity by increasing the size of culverts and conduits.

The area west of Sylvan Street and north of the railroad is a low, wet area of idle land. This has served as a natural storage area and regulates flood flows from the south and west. This area can be preserved or facilities provided to keep this natural storage volume available. Complete filling of this area, along with construction of streets, houses, and other impervious areas, would increase runoff so as to increase damages to the reach downstream.

Floodwater from the 640 acre area south of Route 5 can be controlled by constructing site No. 12-2 as a floodwater retarding structure in the main gorge. Water can be diverted from the east tributary into this storage area by a channel and diversion dam. At maximum development, the flood pool would extend onto the golf course.

The potential for incorporating a recreational development as a multipurpose use in site No. 12-2 to include swimming, boating, and fishing was explored. A maximum surface area of approximately 25 acres could be developed. However, because of the steep sides of the surrounding area, limiting access potential and the high cost involved in the construction of facilities to meet the recreation demand, recreation development does not seem justified.

Site No. 12-2 could also reduce the sediment contributed by the raw streambanks and gullies above the structure.

Erosion and sediment damage caused by sheet and streambank erosion can be reduced through applicable land treatment measures. Improvement of grass and forest cover can control the minor erosion and sediment problems which exist in the watershed.

LOCAL INTEREST IN PROJECT DEVELOPMENT

There was sufficient interest in the problems created by Higinbotham Brook so that the Higinbotham Brook Watershed Association was created in 1958. Membership in the association consisted of those residents whose homes and properties have been damaged by floodwater. There was sufficient interest by this group, the Oneida Chamber of Commerce, and the city of Oneida so that an application for assistance under the PL-566 program was submitted by the Madison County Soil Conservation District in 1959.

Higinbotham Brook Watershed was authorized for planning on September 11, 1959. Planning continued until early 1960 when it became apparent that legal problems were going to delay the project. These legal problems centered around the question of whether the Madison County Board of Supervisors had the jurisdiction to form a county small watershed district covering only the area of the city. Also, it appeared that the county law limited participation in a PL-566 project to county small watershed districts.

A decision from the Attorney General's office in effect stated that the city of Oneida can legally participate in the installation of this project. However, the city did not wish to continue their participation in the project. A resolution of the Common Council of the city of Oneida, New York was passed on March 20, 1962 and is as follows:

> *Resolved that the city of Oneida, New York withdraw their request for a work plan on the Higinbotham Watershed Project until sometime in the future after obtaining overall costs at which time the city may reapply for same.*

After additional meetings with the Council, it became apparent that they were not interested in the project. Planning authorization for the watershed was terminated December 13, 1963.

No request for re-establishing planning authority has been received to date.

The New York State Division of Water Resources, working through the Eastern Oswego Water Resources Planning Board, has expressed interest in developing cost and benefit information on all potential projects in the Basin. Data developed in this report will be used in formulating a water resources plan for the Oswego River Basin.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

Structural Measures

A single purpose floodwater retarding structure, site No. 12-2, located on Higinbotham Brook approximately 600 feet upstream from Route 5 will reduce flood damages. The embankment of the site will include a diversion dam on the eastern tributary. A diversion channel will be excavated to join the two streams and the resulting flood pools. The project map shows the location of the site.

These structures, working as a single unit, will control the runoff from approximately 525 acres and release it at a peak rate of 25 csm. Approximately 130 acre feet of flood and sediment storage will be provided. An earth emergency spillway is provided to pass flood flows in excess of the one percent runoff event. See Tables Ia and Ib.

Land Use and Treatment

This project should include needed land use adjustments and combinations of land treatment practices compatible with the needs and capabilities of the land and the objectives of the people involved.

Recommended conservation practices on cropland and pasture include diversions, waterways, contour farming and strip cropping. These land treatment measures will provide improved water management, increased overall farming efficiency, and reduce runoff, erosion, and sediment production.

Recommendations for forest land include hydrologic stand improvement and intermediate cuttings needed in most of the larger pole and poor sawtimber stands to improve stand vigor and growth, and to favor a residual stand of valuable commercial trees and soil building species. Continued protection to prevent forest fire is basic and essential to derive the maximum benefits from all watershed protection measures.

Land use regulations are recommended to preserve the low, wet area west of Sylvan Street as a natural floodwater storage area. This location could be planned as a wildlife sanctuary or other suitable use compatible with its value as a storage area.

Land use planning and construction procedure controls are recommended to minimize the runoff, erosion, sediment, and environmental problems associated with the expected urban and suburban expansion of the city of Oneida.

Technical assistance will be needed by local planning and zoning boards, and other community leaders to assist them in land use planning and zoning and the development of planned facilities for the entire watershed. Such assistance is needed to retain the optimum amount of vegetative cover for watershed protection on all areas being planned. Assistance can include the identification of areas to be left in vegetative cover for the benefit of the community, temporary debris basins or desilting basins, seeding and mulching exposed areas, temporary diversions and forest buffer zones, infiltration zones and sediment trapping areas. Technical assistance can also be provided to urban developers for on-site plans to minimize the deterioration of the environment balance and the resulting erosion by the maintenance of vegetative cover during development.

This technical assistance is available from agencies of the USDA, and the State of New York. Assistance to individual landowners is available through the Madison County Soil and Water Conservation District's continuing program which emphasizes proper land use and the application of conservation practices to protect and improve all land. Forest management assistance is available through the New York State Conservation Department, Division of Lands and Forests.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

Engineering information used in developing costs was from data developed during watershed planning study made in 1959. Physical data was obtained from a topographic map of site No. 12-2 to a scale of 1"=200' horizontal and 5 foot vertical interval. Cost estimates for fill were based on 1968 prices. The principal spillway was assumed to be a 30 inch reinforced concrete pipe with a rectangular concrete riser providing orifice control. Geologic conditions were found to be favorable.

Operation and maintenance costs associated with this structure were based on costs used in PL-566 projects. See Tables II, III and IV.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

A combined program of land treatment and structural measures will have a significant effect in providing watershed protection and in reducing floodwater and sediment damages.

Under present conditions, minor flooding occurs about once every two and one-half years causing inconveniences and monetary losses to urban areas. Efforts were made to find a justified solution to eliminate flooding from the one percent chance storm, but none were found. Under the proposed project, average annual damages would be reduced 80 percent. All damages up to the 15 percent chance storm will be eliminated. The retarding structure will reduce sediment transport through the urban reach.

It is estimated that the total average annual benefits occurring from the installation of site No. 12-2 will amount to $17,270. Remaining damages with the project installed are estimated to be $4,080.

A project life of 100-years was used in determining average annual costs and benefits. The preliminary cost estimate for the installation of the single purpose floodwater retarding structure is $153,000. The average annual cost of this structure when amortized at 4-7/8 percent is estimated to be $7,520. Operation and maintenance is estimated to be $500. The total average annual cost is estimated to be $8,020. The benefit cost ratio is 2.2:1. See Tables V and VI.

ALTERNATE OR ADDITIONAL POSSIBILITIES

During PL-566 planning in 1960, the possibility of constructing a silting basin and temporary floodwater storage area west of Sylvan Street was explored. This is still physically possible as the area has not been encroached upon by urban development. No measure of costs or effects of this basin was made during this study.

If strong interest is shown in recreational use in site No. 12-2, a more detailed recreational analysis could be made at a later date.

It should again be pointed out that a seven-year level of protection is provided. In 1960, the local sponsoring organization was advised of and were agreeable to the lower level of protection. However, a work plan would stand a better chance of approval if it provided for zoning of the inadequately protected area against further development to prevent the possibility of creating a greater flood hazard than now exists.

The above-mentioned possibilities of a silting basin, a recreational development, and zoning of inadequately protected areas will warrant consideration when a firm plan is being considered for authorization by local sponsors.

TABLE 1a - STRUCTURE DATA

Higinbotham Brook Watershed, Oswego River Basin

Site Number	Drainage Area	Est. Height of Dam	Est. Vol. of Fill	Principal Spillway Type	Principal Spillway Release Rate	Emergency Spillway Type	Emergency Spillway % Chance of Use	Max. Surface Area Emerg. Spillway Level
	Sq. Mi.	Feet	Cu. Yd.		CSM			Acres
12-2	0.82	52	44,000	Reinforced Concrete Pipe Restricted Riser	25	Veg.	1	9

June 1970

TABLE 1b - RESERVOIR STORAGE CAPACITY

Higinbotham Brook Watershed, Oswego River Basin

Site Number	Drainage Area	Storage Capacity Planned: Sediment	Storage Capacity Planned: Detention	Storage Capacity Planned: Flood Prevention	Storage Capacity Planned: Total	Additional Storage Capacity Available
	Sq. Mi.	- - - - - - - - - - - - - - Acre Feet (inches equivalent) - - - - - - - - - - - - - - -				
12-2	0.82	15 (.34)	115 (2.6)	130 (2.94)	130 (2.94)	330

June 1970

TABLE II - ESTIMATED STRUCTURAL COST-POTENTIAL DEVELOPMENT

Higinbotham Brook Watershed, Oswego River Basin

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) 1/
STRUCTURAL MEASURES			
Construction			
Floodwater Retarding Structure 12-2	Ea.	1	111,000
Subtotal - Construction			111,000
Engineering Services			10,000
Project Administration			20,000
Land Rights			10,000
Administration of Contracts			2,000
TOTAL STRUCTURAL MEASURES			153,000

1/ Price Base: 1968

June 1970

TABLE III - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Higinbotham Brook Watershed, Oswego River Basin
(Dollars) 1/

Structural Measures	Installation Cost					
	Construction	Engineering	Project Administration	Land Rights	Administration of Contracts	Installation Cost
Site 12-2	111,000	10,000	20,000	10,000	2,000	153,000

1/ Price Base: 1968

June 1970

TABLE IV - COST ALLOCATION AND COST SHARING SUMMARY

Higinbotham Brook Watershed, Oswego River Basin
(Dollars) 1/

Item	Cost Allocation		Cost Sharing			
	Purpose		Public Law 566		Other	
	Flood Prevention	Total	Flood Prevention	Total	Flood Prevention	Total
12-2	131,000	131,000	121,000	121,000	10,000	10,000
Subtotal	131,000	131,000	121,000	121,000	10,000	10,000
Project Administration		22,000		20,000		2,000
GRAND TOTAL		153,000		141,000		12,000

1/ Price Base: 1968

June 1970

TABLE V - ANNUAL COST

Higinbotham Brook Watershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
Site 12-2	6,440	500	6,940
Project Administration	1,080	--	1,080
GRAND TOTAL	7,520		8,020

1/ Price Base: 1968
2/ 100 years at 4-7/8 percent interest

June 1970

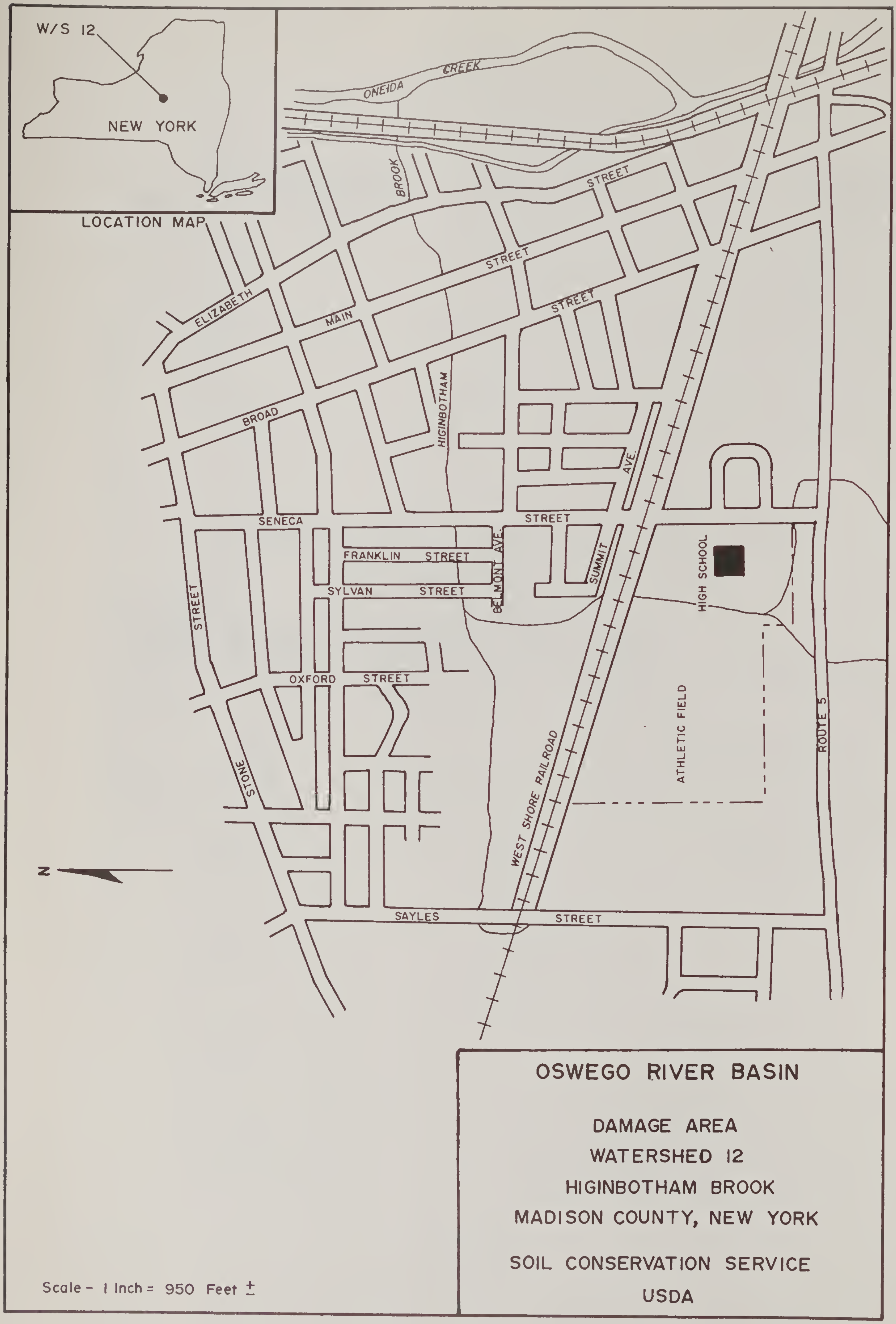
TABLE VI - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Higinbotham Brook Watershed, Oswego River Basin

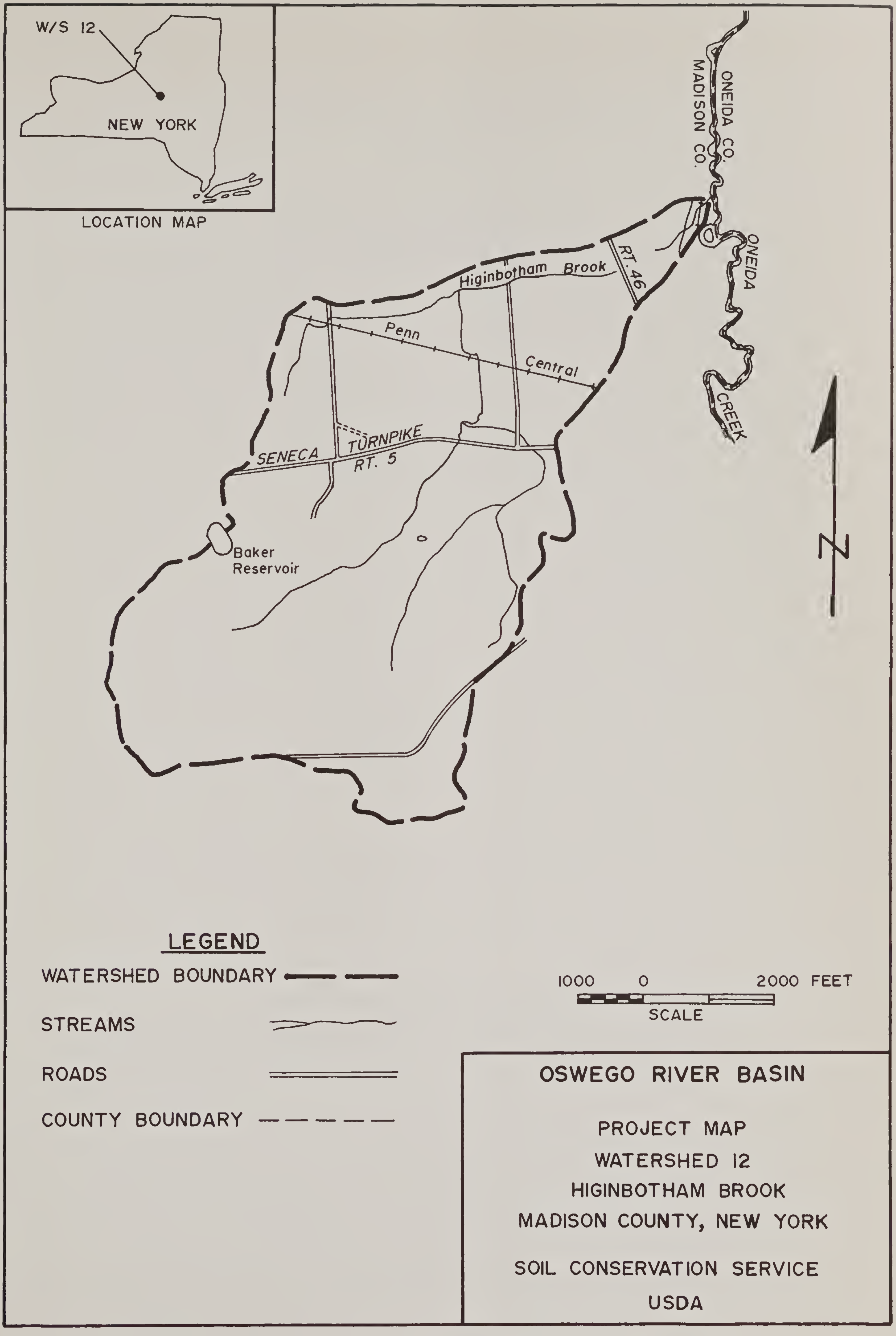
Evaluation Unit	Average Annual Benefits 1/				
	Damage Reduction	Secondary	Total Avg. Ann. Benefits	Total Avg. Ann. Costs	Benefit Cost Ratio
Site 12-2	15,700	1,570	17,270	6,940	2.5:1
Project Administration				1,080	
GRAND TOTAL				8,020	2.2:1

1/ Price Base: 1968

June 1970



W/S 12
NEW YORK
LOCATION MAP
ONEIDA CREEK
BROOK
STREET
ELIZABETH
MAIN
STREET
STREET
BROAD
HIGINBOTHAM
AVE.
SENECA
STREET
FRANKLIN STREET
SYLVAN STREET
BELMONT AVE.
SUMMIT
HIGH SCHOOL
STREET
OXFORD STREET
STONE
WEST SHORE RAILROAD
ATHLETIC FIELD
ROUTE 5
N
SAYLES STREET
OSWEGO RIVER BASIN
DAMAGE AREA
WATERSHED 12
HIGINBOTHAM BROOK
MADISON COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
USDA
Scale - 1 Inch = 950 Feet ±


W/S 12
NEW YORK
LOCATION MAP
ONEIDA CO.
MADISON CO.
ONEIDA
CREEK
RT. 46
Higinbotham Brook
Penn
Central
SENECA TURNPIKE
RT. 5
Baker
Reservoir
N
LEGEND
WATERSHED BOUNDARY
STREAMS
ROADS
COUNTY BOUNDARY
1000 0 2000 FEET
SCALE
OSWEGO RIVER BASIN
PROJECT MAP
WATERSHED 12
HIGINBOTHAM BROOK
MADISON COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
USDA

MUD CREEK WATERSHED INVESTIGATION REPORT

Watershed 88

Western New York Type IV River Basin

Oswego River Basin

Onondaga County, New York

September 1971

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service   Economic Research Service   Forest Service

MUD CREEK WATERSHED INVESTIGATION REPORT

Oswego River Basin
Onondaga County, New York

September 1971

THE WATERSHED IN BRIEF

The Mud Creek Watershed is located in Onondaga County, south of the Oneida River, in the towns of Clay and Cicero. This watershed has a drainage area of 33 square miles and includes the villages of North Syracuse, Cicero, and Euclid. The village of North Syracuse has a population of 8,700 according to the 1970 census, an increase of 17 percent since 1960. The town of Clay increased its population by 104 percent during the decade 1960 to 1970 to 36,274 and the town of Cicero increased its population by 53 percent to 22,539.

State Route 31 and Bear Road run east and west through the watershed, and Interstate 81 and U.S. Route 11 run north and south. Interstate 481 is being constructed in the watershed at the present time. These highways combined with the relatively short driving distance to Syracuse (approximately 10 miles from downtown Syracuse to North Syracuse), make this watershed highly desirable for increased urbanization. The topography is gently rolling with elevations ranging from 375 msl at the confluence with the Oneida River to 435 msl near the Thompson Road and Island Road intersection in the south-central part of the watershed.

The soils in the watershed are lake plain soils, and were the bed of old Lake Iroquois. Much of the area around Cicero and Euclid is covered with Dunkirk silt loam, a soil with good drainage and a history of high agricultural desirability. The area west of North Syracuse is covered by Alton gravelly fine sandy loam, a well drained soil that in the past has been used for market-garden crops. Colonie loamy fine sand located near North Syracuse and Oak Orchard, is thoroughly drained and has been used for market-garden crops in the past.

Arkport very fine sandy loam is also found in the watershed. This soil has a deep root zone, and responds well to intensive management practices. Wallington silt and Wallington very fine sandy loams, somewhat firm and easily worked soils found in the watershed, have a fragipan at a depth of about 12 to 15 inches. These soils are generally poorly suited to urban use.

Collamer silt loam, found in the eastern part of the watershed has a hardpan at a depth of about 20 inches. The general farming crops that have been grown on this soil in the past do not produce the yields of other soils in the watershed. Muck soils are found in quantity in two areas in the watershed. One is on the southern edge of Little Cicero Swamp, and the other is on the western end of Cicero Swamp. This muckland is naturally poorly drained. However, with drainage, this soil can be used intensively for market crops.

While the watershed has been primarily agricultural in the past, the previous decade has seen a rapid change in the land use from agriculture to urban, and demographers and planners forecast this trend will continue. The present land use is as follows:

Urban	21%
Cropland	15%
Pasture	3%
Forest	16%
Idle	45%
	100%

Mean annual rainfall in the Mud Creek Watershed is about 36 inches, with the distribution of the precipitation being fairly uniform throughout the year. The average annual snowfall is 105 inches. Approximately 19 inches of rainfall can be expected during the 184 day growing season, and the average temperature during the growing season is 63 degrees.

The larger blocks of forest land are located in Cicero Swamp area at the eastern end of the watershed and in the Little Cicero Swamp area along the lower reaches of Mud Creek. The remainder of the forest land is in small woodlots scattered throughout the watershed. Major timber types are northern hardwood on the better drained sites, with ash-elm-red maple occupying most areas with a high water table. There are several small softwood plantations throughout the watershed. Forest products consist of sawlogs and firewood.

There are approximately 1,500 acres of the watershed in the Cicero State Game Management Area and 260 acres in Hancock Field. The wooded wetlands in the Cicero Game Management Area contain some rare and unique flora.

The watershed contains approximately 700 acres of wetlands, type III and IV, and approximately 2,400 acres of wetlands, type VI and VII. All these wetlands are flooded each spring and occasionally in the fall. They are used primarily by migrating waterfowl, however, some remain to nest during the summer.

WATERSHED PROBLEMS AND NEEDS

The major problems of the watershed are inundation of the muckland and water in basements and yards in North Syracuse. Water on the muck delays planting in the spring, and causes damage to market crops during the growing season. This crop damage ranges from reduced yields to loss of crop depending on the severity of flooding. In recent years, high water has caused abandonment of the lower sections of the muck so that the acreages farmed have dwindled from 300+ acres to 119 acres. Damage to the dikes from muskrats is a problem.

Urban damages are confined to yards and basements. Investigation of tributaries of Mud Creek running through North Syracuse shows that yards and basements are damaged directly by 5 and 10-year frequency storms. Study of drainage patterns in the village of North Syracuse shows that the reported damages to urban properties are due to a lack of adequate drainage. An outlet for an urban drainage system is available, but the discharges from these systems could damage the muckland. While no damages have been reported, the bowling alley at Cicero lies within the one percent chance storm's flood line.

Land treatment needs in this watershed are primarily related to erosion and sediment problems occurring during the conversion of land to urban uses and the resulting effects on the environmental quality level. If the present trend continues, a large part of the forest and grassland will eventually be developed for urban uses. Proper planning, management and control measures are needed to prevent excessive soil loss and sedimentation during urban development which would adversely affect water quality, fish and wildlife habitat, and degrade the natural environment.

Protection and orderly development of land, water and related resources throughout the watershed are necessary if this area is to remain an enjoyable place to live, work and play. Consideration should be given in urban planning to such items as: soil suitability, erosion and flooding hazards, open space and wetland areas, and the preservation, conservation and improvement of natural resources and the quality of the environment.

The increasing pressure of urbanization on the remaining natural open space areas is creating an urgent need for measures that will preserve and enhance these areas for their fish and wildlife resource values and their contribution to a balanced ecology in the watershed.

PHYSICAL POTENTIAL FOR MEETING NEEDS

Two potential solutions to alleviate the flooding of the mucklands were studied. They were to deepen and enlarge the channel through Little Cicero Swamp, or to dike out the mucklands and pump the floodwater from them. An urban drainage system can be installed that would solve most of the urban flooding.

There are many objections to doing any channel improvement through Little Cicero Swamp. It would have a construction cost over $400,000 and would damage or destroy the wetlands at the lower end of the swamp. The channel would drain type III, IV and V wetlands as described in the U.S. Department of Interior, Fish and Wildlife Circular 39, *Wetlands of the United States*. Therefore, no federal funds can be used for construction or for technical assistance.

The dike system can be improved around the mucklands that are now in production. This will protect approximately 170 acres. Runoff from the upland areas can be diverted so that only floodwaters from the mucklands will have to be pumped.

LOCAL INTEREST IN PROJECT DEVELOPMENT

The local people have expressed interest in the flooding problems in the watershed. The muck farmers have written letters to the Department of Health and local politicians. They have had photographs taken of flooding problems and have personally visited Congressional representatives in Washington.

Urban residents have reported flooding on their properties to the district conservationist, Soil Conservation Service, Onondaga County. Problems have been increased with the urbanization of the watershed and more people have become affected by flooding.

A request for a preliminary investigation of the watershed has been made by the local muckland farmers.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

LAND USE AND TREATMENT

Land treatment needs are expected to occur during residential, commercial, industrial and related developments. Review of development plans, and providing recommendations for land treatment measures and technical assistance for their installation, are anticipated technical services that should be provided. Assistance should be furnished to state and local planning boards, community leaders, and land developers to provide direction and to establish regulations for the wise use and protection of land undergoing development and in determining the environment quality levels.

Specific practices should be recommended depending upon the needs for a specific area. Some practices that can be recommended are: the protection and maintenance of existing vegetation wherever feasible; the installation of temporary debris or desilting basins; surface water control and disposal measures; seeding, tree planting and mulching; and forest buffer or other infiltration zones.

Other measures or changes such as preservation of maximum acreages of woodland, wildlife land, agricultural land, recreation land and open space; installation of water bodies for recreation, fish and/or wildlife; detailed planning for future urban land use changes; and changes in land use will be needed to protect and improve the environmental quality level. The exact practices to be installed should be based on the specific needs. Soils information should be used to guide decisions regarding selection of practices and land use changes.

The wetland could be improved for waterfowl by developing more open water that would remain throughout the summer for brood raising. This can be done by constructing level ditches and potholes. The use of draglines would be recommended rather than blasting because the piled spoil would serve as areas for nesting. With the suburban area surrounding much of the area and restricting nesting, these spoil areas would serve as adequate nesting areas.

STRUCTURAL MEASURES

Approximately 8,900 feet of dike averaging 5 feet in height is needed to enclose the mucklands. A diversion channel will be installed along the south side of the muckland to intercept floodwater coming from the adjacent uplands.

To remove the runoff from the muckland, a pumping plant capable of pumping 12,600 gpm is required. One 24-inch diameter propeller pump can be used. A concrete or sheet piling sump will be required. See Tables 1c and 1d.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

The estimated cost of the structural measures is $239,200. The pumping plant is estimated at $66,600. These estimates were made from studies of a 2-foot contour map supplemented with field surveys. See Tables 2,3, and 4.

The pumping plant cost was estimated by using a unit price of $1,500 for each cfs pumped. A unit price of $2.50 per cubic yard was used for compacted fill.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

The existing channels are capable of containing the normal runoff from urban areas. The dike system protecting the muckland is not adequate to prevent flood damage to it. Due to these circumstances, all costs and benefits are allocated to agricultural flood prevention.

Annual direct damage reduction accruing through the installation of a project is estimated to be $13,834. Benefits derived from changed agricultural land use (returning abandoned muckland to production), are estimated to equal $5,991, and include provisions for a 5-year implementation lag. This yields a primary benefit-cost ratio of 1.03 to 1.0.

Secondary benefits stemming from the project are 10 percent of the direct annual benefits, or $1,384. This does not include any national effects.

The project has been planned with a life of 25 years. Preliminary cost estimates of construction are $239,200. Amortization at 5 3/8 percent interest yields an average cost of $15,530 per year. The operation and maintenance cost estimated at 1.03 to 1.0.

Secondary benefits stemming from the project are 10 percent of the direct annual benefits, or $1,384. This does not include any national effects.

The project has been planned with a life of 25 years. Preliminary cost estimates of construction are $239,200. Amortization at 5 3/8 percent interest yields an average cost of $15,530 per year. The operation and maintenance cost estimated at 1.0 percent of construction cost is $1,700 per year. Total annual cost is estimated to be $19,310 which includes $2,080 for project administration.

The benefit cost ratio is 1.10 to 1.0 when secondary benefits are included. This results in a net benefit per acre of $125 over the 170 acres of the project area. Primary benefits alone yield a benefit of $117 per acre.

The effects of installing the project will be a decrease in the frequency of flooding on the muckland during the growing season, and an increase in the ability of the muck operators to work the muckland earlier in the spring. The former effect will greatly reduce the chances of crop loss due to flooding that has become such a problem in recent years. The latter effect will give the muck farmers an advantage of being able to market their crops earlier in the season when market prices for produce are higher. This will also extend their growing season which can be quite important when the types of vegetables these farmers grow are considered.

A land treatment program will lessen the detrimental effects of urban development on the hydrologic condition of the lands; control excessive soil erosion and sedimentation from disturbed areas; promote wise land use, encourage orderly development, and maintain and improve the Environmental Quality Level. Installed measures and multiple use management will protect and enhance recreation, fish and wildlife values, and the environmental quality of the watershed.

ALTERNATE OR ADDITIONAL POSSIBILITIES

Under Public Law 566, the USDA cannot provide assistance to the village of North Syracuse to plan or install urban drainage. Assistance of this type can be obtained from other state and federal agencies. Assistance in land treatment can be obtained from the Onondaga County Soil and Water Conservation District. Forest management assistance is available through the New York State Department of Environmental Conservation, Division of Lands and Forests.

Rehabilitation and improved maintenance of the existing dikes around the muckland is needed.

TABLE 1c - CHANNEL DATA

Mud Creek Watershed, Oswego River Basin

Channel Designation	Length of Reach (ft.)	Watershed Area (sq.mi.)	Needed Channel Capacity (cfs)	Bottom Width (ft.)	Depth (ft.)	Velocity in Channel (ft./sec.)	Estimated Volume of Excavation (cu.yds.)
Diversion	3,800	88	45 1/	4	3.4	1.45	4,400

1/ 10-year discharge.

September 1971

TABLE 1d - STRUCTURE DATA

Mud Creek Watershed, Oswego River Basin

Item	Watershed Area (sq.mi.)	Needed Capacity (cfs)	Estimated Volume Concrete (cu.yd.)	Drop (ft.)	Remarks
Pumping Plant	173	12,600	--	--	24" dia. pump

September 1971

TABLE 2 - ESTIMATED STRUCTURAL COST-POTENTIAL DEVELOPMENT

Mud Creek Watershed, Oswego River Basin

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) 1/
STRUCTURAL MEASURES			
Construction			
Pumping Plant	Ea.	1	48,700
Dike	Ft.	8,900	115,400
Diversion	Ft.	3,800	4,900
Subtotal - Construction			169,000
Engineering Services			28,300
Project Administration			24,900
Land Rights			13,600
Administration of Contracts			3,400
TOTAL STRUCTURAL MEASURES			239,200

1/ Price Base: 1971

September 1971

TABLE 3 - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Mud Creek Watershed, Oswego River Basin

(Dollars)[1/]

Structural Measures	Installation Cost: Construction	Installation Cost: Engineering	Installation Cost: Project Administration	Installation Cost: Land Rights	Installation Cost: Administration of Contracts	Total Installation Cost
Pumping Plant	48,700	8,800	7,800	300	1,000	66,600
Dike	115,400	18,500	16,200	8,200	2,300	160,600
Diversion	4,900	1,000	900	5,100	100	12,000
TOTAL	169,000	28,300	24,900	13,600	3,400	239,200

1/ Price Base: 1971.

September 1971

TABLE 4 - COST ALLOCATION AND COST-SHARING SUMMARY

Mud Creek Watershed, Oswego River Basin

(Dollars)[1/]

Item	Cost Allocation (Purpose): Flood Prevention	Cost Allocation (Purpose): Total	Cost-Sharing, Public Law 566: Flood Prevention	Cost-Sharing, Public Law 566: Total	Cost-Sharing, Other: Flood Prevention	Cost-Sharing, Other: Total
Pumping Plant	57,800	57,800	57,500	57,500	300	300
Dike	142,100	142,100	133,900	133,900	8,200	8,200
Diversion	11,000	11,000	5,900	5,900	5,100	5,100
Subtotal	210,900	210,900	197,300	197,300	13,600	13,600
Project Administration		28,300		24,900		3,400
GRAND TOTAL	210,900	239,200	197,300	222,200	13,600	17,000

1/ Price Base: 1971

September 1971

TABLE 5 - ANNUAL COST

Mud Creek Watershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
Dike & Pumping Plant	15,530	1,700	17,230
Project Administration	2,080	--	2,080
GRAND TOTAL	17,610	1,700	19,310

1/ Price Base: 1971; adjusted normalized O&M.
2/ 25 years @ 5 3/8 percent interest.

September 1971

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

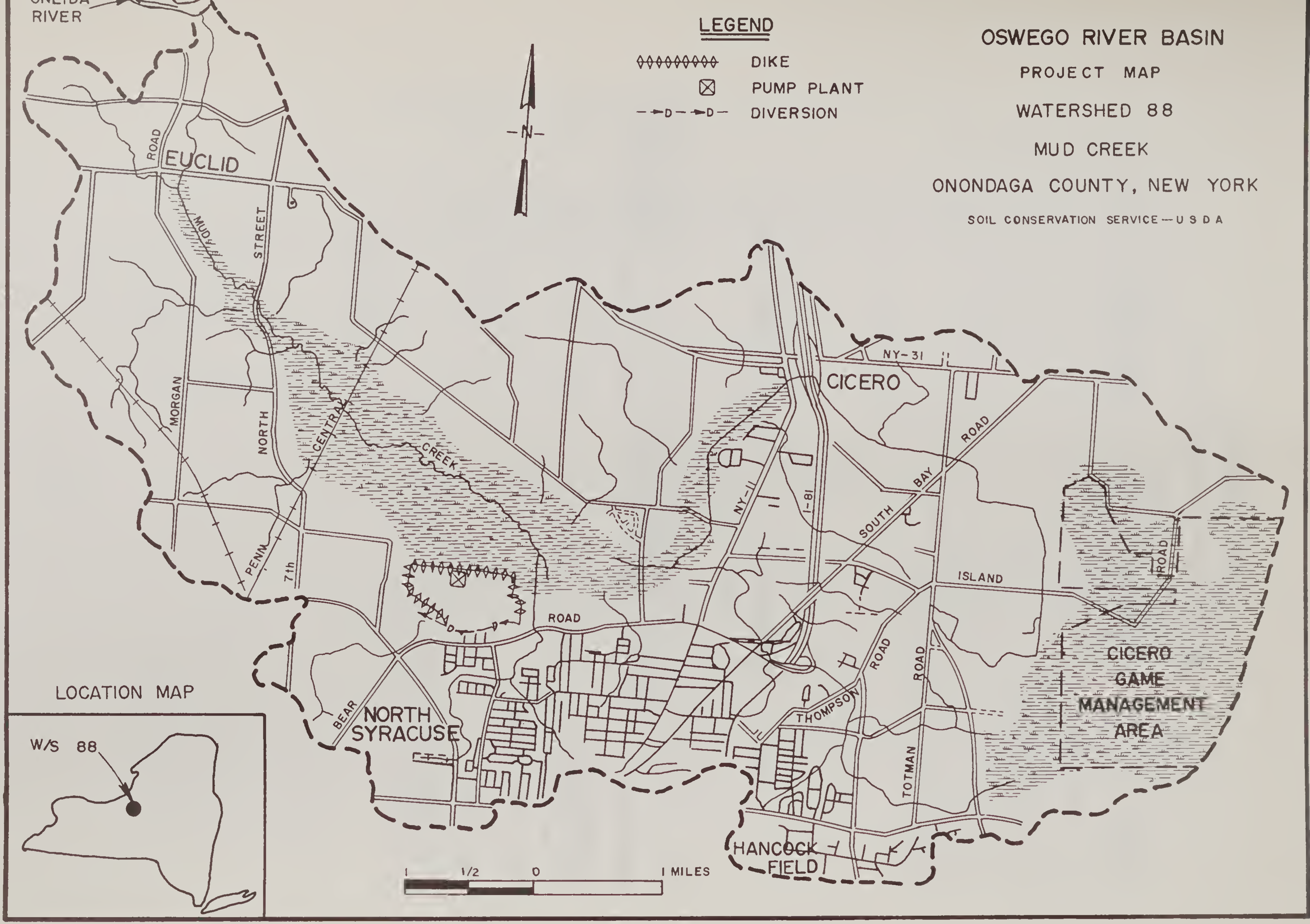
Mud Creek Watershed, Oswego River Basin

(Dollars)

EVALUATION UNIT	AVERAGE ANNUAL BENEFITS 1/					Average Annual Cost 3/	Benefit Cost Ratio
	Damage Reduction	Changed Land Use: Agr.	Changed Land Use: Urban	Secondary	Total		
Pumping Plant Dike & Diversion	13,834	5,991	--	1,384	21,209	17,230	1.23:1.0
Project Administration						2,080	
GRAND TOTAL	13,834	2/ 5,991	--	1,384	21,209	19,310	1.10:1.0

1/ Price Base: 1971
2/ No on-farm costs are included in the project.
3/ From Table 5.

September 1971



OSWEGO RIVER BASIN
PROJECT MAP
WATERSHED 88
MUD CREEK
ONONDAGA COUNTY, NEW YORK
SOIL CONSERVATION SERVICE — U S D A
LEGEND
DIKE
PUMP PLANT
DIVERSION
N
RIVER
EUCLID
ROAD
MUD
STREET
MORGAN
NORTH
CENTRAL
CREEK
PENN
7th
ROAD
NY-31
CICERO
ROAD
BAY
SOUTH
NY-11
I-81
ISLAND
ROAD
ROAD
ROAD
THOMPSON
TOTMAN
CICERO
GAME
MANAGEMENT
AREA
BEAR
NORTH
SYRACUSE
HANCOCK
FIELD
LOCATION MAP
W/S 88
1
1/2
0
1 MILES

ROME MUCK SUBWATERSHED INVESTIGATION REPORT

TRIBUTARY OF UPPER WOODS CREEK - WATERSHED NO. 127

Western New York Type IV River Basins

Oswego River Basin

Oneida County, New York

February 1970

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service Economic Research Service Forest Service

ROME MUCK SUBWATERSHED INVESTIGATION REPORT

TRIBUTARY OF UPPER WOODS CREEK - WATERSHED NO. 127
Western New York Type IV River Basins
Oswego River Basin
Oneida County, New York

February 1970

THE WATERSHED IN BRIEF

Rome Muck subwatershed is located in central New York within the southern boundary of the city of Rome (population 51,600) in Oneida County. Syracuse is 38 miles west and Utica 12 miles southeast. The watershed is part of the Upper Woods Creek Watershed No. 127 and is in Land Resource Area L-101, the Ontario-Mohawk Plain of the Lake States Fruit, Truck and Dairy Region. The 5.2 square miles (3,330 acre) Rome Muck drainage area flows into the New York State Barge Canal. Three main transportation routes are located within close proximity to the watershed. The New York State Barge Canal forms the northern edge of the watershed; the New York State Thruway is located about 3 miles to the south; and a main line of the Penn-Central Railroad crosses the watershed.

Mean annual rainfall in the Rome Muck area is 47 inches and this yields about 22 inches of runoff annually. Distribution of the precipitation is fairly uniform throughout the year with the maximum amounts occurring during the months of June and July. More than 22 inches of rainfall can be expected during the 143 day growing season.

Temperatures range from a low of -27° to a high of 98° and averages about 47°. During the growing season the average temperature is 64°. Because of the location of the subwatershed at the head of the Mohawk Valley, westerly winds are funneled across the muck causing erosion during dry periods.

Watershed cover includes forested 24 percent (800 acres) and open land 76 percent (2,530 acres). The following table shows a more detailed breakdown of the land use in the watershed:

Land Use	Percent	(Acres)
Open Land		
Crop	48	(1600)
Pasture, Idle, Hay	19	(630)
Urban, Other	9	(300)
Forest Land	24	(800)
TOTALS	100	(3330)

Of the 1,600 acres of cropland, 620 acres are muckland while the remainder are on upland areas. The main crops grown on the muckland include onions, potatoes, and lettuce. On upland cropland, dairy support crops such as corn, oats, and hay are grown. Approximately 12 owners farm the muckland and there are 12 operating farms in the upland areas.

The largest concentration of forest land is adjacent to the Barge Canal in the northwestern part of the watershed. Approximately 120 acres of forest land is state-owned land, managed by the Rome State School. The remaining area is in private ownership. There is a 65 acre plot of forest land on muck soil which has not been cleared for cultivation because of the water problems associated with it.

Elm-red maple is the predominant timber type and is generally found on lowland areas. Beech-birch-sugar maple is found on upland sites.

The harvest of forest products is generally confined to pole and sawtimber stands which cover approximately 80 percent of the forested area. There is a good market for sawlogs with several sawmills in the area.

Although urban and other land makes up only 9 percent of the watershed, the city of Rome is growing and the resulting expansion will put pressure on the watershed. Several upland farms already are being subdivided for home sites. A strip of land along both sides of James Street, Lawrence Street, and Route 365 is presently zoned commercial.

Upland soils are mainly glacial tills of the Hilton association and glacial outwash of the Howard association. These soils are moderately to well drained and mainly support dairy farming. Muck and peat associations are found on the lowlands, and some of these soils are intensively truck farmed. Depth of the muck soils is variable, but according to soil maps most of the area has over 3 feet of this organic soil. Some muckland north and west of the railroad has not been cleared because of a very high water table and a lack of a relatively impermeable barrier between these muck soils and the Barge Canal.

Although there is no wildlife on the cleared muckland, there are a few deer, rabbits, and pheasants in the uplands of the watershed. No significant fishery is found in the ditch systems of the muckland.

WATERSHED PROBLEMS AND NEEDS

Since clearing of 620 acres of muckland for cultivation, subsidence has occurred and caused a lowering of the muck surface elevations. As a result, the invert elevations of the four culverts which carry runoff under the Penn-Central Railroad embankment are too high and the culverts too small to allow proper outlets for flood flows and to provide adequate agricultural drainage.

Flooding of the mucklands results from excess water from the uplands and insufficient culvert capacity which results in ditch overtopping. The State Ditch culvert can only carry the 1-2 year frequency storm before water begins to back up. This backed up water then flows east and adds to that water going through the main culvert which drains the muck west of James Street. This main culvert also has a 1-2 year capacity and backs up quickly to flood the mucklands. Similar problems exist with the James Street and Lawrence Street culverts. Additional flow from the uplands is channeled through culverts under Route 365 onto the muck thus compounding the problem.

Average annual damage in Rome Muck is $40,482. This damage is to the vegetable crop - primarily onions and lettuce, and results from delayed spring planting and inundation of the muck during the growing season. Damages include (1) increased cost of production, (2) decrease in quality of products, (3) decreased yields, (4) restricted choice of the type of crop, and (5) complete loss of crops in some cases.

Wind erosion of the muckland occurs during periods of dryness and is the biggest erosion problem. There are no protective measures such as windbreaks to control this type of erosion. Control of this erosion can extend the life of the mucklands.

There are no other significant sediment or erosion problems within the watershed. On upland cropland, some conservation treatment appears to be needed to protect the longer slopes and to permit a change in management and result in a more efficient operation.

The entire 620 acres of cleared muckland, plus the additional 65 acres of forest land which could be cleared for cultivation, has the potential for irrigation. Some irrigation is now being attempted, but it is being done in a random fashion only as an emergency measure during extremely dry periods. Irrigation is needed to control wind erosion, seed losses, and seedling damages. In addition, it will increase the quality and quantity of the products grown.

Because of the high inlet elevation of the four culverts under the railroad, proper drainage cannot be obtained. This impaired drainage is also aggravated by a lack of depth and capacity in the existing ditches. The problems experienced from the lack of drainage are similar to the agricultural damages previously described.

The hydrologic condition of forest land is generally good. Thinnings are needed in some pole stands to improve vigor, regulate stand density, and increase the percentage of desirable species. In addition, some control of grazing of woodlands is needed and harvest operations should be supervised to prevent deterioration of hydrologic condition.

Urban and suburban expansion of the city of Rome could have a deteriorating effect on the natural environment unless adequate land use planning is provided. In densely populated areas, vegetation grows under extremely adverse conditions of soil, water and air. Man-made structures and pollution provide the greatest problem and adverse conditions. In addition, serious problems - environmental, social, and economic in nature - are created by the expansion of the city into rural countryside. These problems relate to retention of open space, changing land values, taxation, and dislocation of rural-based enterprises.

PHYSICAL POTENTIAL FOR MEETING NEEDS

Land treatment measures can be installed on both the uplands and mucklands which will reduce the flooding problem and allow proper management of runoff for better water level control.

Practices needed and feasible to install on upland farms are: strip cropping, contour farming, conservation cropping systems, diversions, and tile. Before any practices can be effectively utilized on the muckland, the project measures must first be installed. Needed on-farm measures on the muckland include: windbreaks, drainage land grading, tile, and water management structures.

These measures can meet the land treatment needs only if the measures are completely planned and integrated, adequately engineered, well constructed, properly managed and adequately maintained.

Most of the forest land has a good potential to improve hydrologically. Proper drainage in the muckland areas will remove excess water from the state-owned forest land.

The watershed has relatively flat topography and an examination of the area showed that no potential floodwater retention sites are available which would provide measurable floodwater control downstream. A gravity outlet channel or a pumping plant to provide flood control and drainage were the basic alternatives considered. A pumping plant and pipeline were found to be necessary to provide irrigation water.

Consideration was given to a proposal to enlarge the present ditches and lower the present culverts. This system does not eliminate overland flows from Route 365. A modification provided a diversion along Route 365 outletting into the ditches.

Another possibility was to bring all the excess water to a large culvert which would provide capacity for a 10-year storm. This alternative includes the diversion and enlarged ditches.

The last alternative considered was a pump plant in place of the gravity culvert. This plan was found unfeasible.

After consideration of the alternatives, the system using a diversion, enlarged ditches, and a gravity culvert through the railroad embankment was found to provide an acceptable level of protection at the lowest cost.

In addition to these flood control alternatives, a pump system to provide irrigation water was considered. This irrigation system could be combined with any of the alternatives and would pump water from the Barge Canal into the ditch system where the farmers can pick it up with their sprinkler pumps. Part of the water would be piped to the diversion at James Street and released into the upper parts of the ditch system. The remainder would be put into the ditches above the water control structure at the main culvert.

Builders and owners have not built in the flood plain upstream from the muck. Consideration should be given to flood plain regulation zoning to prevent future development of properties subject to damage.

LOCAL INTEREST IN PROJECT DEVELOPMENT

In the early thirties, muckland owners formed a drainage district under provisions of the New York State Conservation Law. A district was formed for the Rome Muck, but since the program required the local people to pay most of the costs incurred, the approach was unsuccessful. This district is still a legal entity today although it is inactive.

In the early forties, the Soil Conservation Service provided technical assistance to small groups of farmers for ditching in the muck area. Assistance to individual farmers has been carried out over the years through the preparation of individual farm plans, but this did not solve the problems.

Numerous other efforts were made by the muckland owners to solve their problem. However, these efforts were not successful.

The local people have approached the Oneida County Soil and Water Conservation District and requested assistance in applying for a PL-566 project. The application has been completed and will be submitted upon receipt of a favorable preliminary examination.

The Eastern Oswego Regional Water Resources Planning Board is presently developing a plan for the Eastern Oswego River Basin which includes the Rome Muck Watershed. This Board is provided technical assistance through the Division of Water Resources, New York State Conservation Department.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

Land Treatment

The Oneida County Soil and Water Conservation District's continuing program of assistance to landowners, emphasizes proper land use and the application of conservation practices to protect and improve all land.

Application of recommended conservation practices on cropland includes conservation cropping systems, cover crops, tile drains, drainage mains and laterals, water control systems and windbreaks. Practices recommended on grassland include planting and renovation, fencing, rotation grazing and farm ponds.

Forest fires are not a serious problem now, but continued protection is essential to derive the maximum benefits from the watershed.

There is very little idle land in need of tree planting. Thinnings in pole stands will improve tree vigor and growth, thereby favoring a residual stand of valuable commercial trees and soil building species.

Technical assistance is available to the county planning board, local community leaders, and developers in multiple-use planning on private, non-industrial lands in the watershed. Assistance of this type is needed to retain and improve for watershed protection, the optimum amounts of cover on areas being planned for urban use. Technical assistance can be provided to developers for on-site plans to minimize the deterioration of the hydrologic balance and the resulting erosion by the maintenance of vegetative cover during the development. Urban developers will also be encouraged to utilize the natural landscape in their planning.

Structural Measures

A field reconnaissance was made of the area along with limited field surveys of some of the ditches. From this information, the following solution to the flood prevention drainage and irrigation problems of the Rome Muck is recommended. (See project map). This plan includes 5.2 miles of ditch construction, 0.9 miles of diversion, a culvert under the railroad embankment and a pumping system for irrigation. Table V gives the design data for all structural measures.

1. The main culvert under the railroad, approximately 2,600 feet west of James Street, will be replaced with a larger culvert. The new culvert will have a water control structure at the inlet to provide water level regulation in the project area. No gate or other control type measure is required on the outlet end of the culvert.

2. A diversion will be constructed from James Street to Lawrence Street, parallel to and just north of Route 365. The purpose of this diversion is to intercept the floodwater from the uplands, channel it into Ditch 3, and thereby keep it from spreading over the muckland.

3. A channel (Ditch 3) will be constructed from the diversion, starting at a point approximately 2,200 feet west of Lawrence Street, to the main culvert under the railroad. This channel will carry the floodwater from the diversion through the muckland. A drop structure (No. II) will be needed approximately 1,300 feet east of James Street to reduce the velocity in the channel. Included in this structure will be a water level control feature. A bridge over this channel will be required at James Street.

4. The following ditches will be enlarged to carry the drainage and floodwater from the mucklands:

    a. Ditch No. 1 will be constructed from the intersection of Lawrence Street and Route 365 to Martin Street approximately 1,100 feet east of James Street continuing along Martin Street to James Street. The ditch will cross under

James Street through a culvert and continue along the railroad to the main culvert. The lateral (No. 1a) flowing north along the east side of James Street, will also be enlarged.

b. Ditch No. 2 will be constructed starting near the intersection of James Street and Route 365 and continuing northwest to the railroad approximately 4,600 feet west of the main culvert and then eastward along the railroad to the main culvert. A drop structure (No. I) will be required where the ditch turns eastward at the railroad. This will permit flood flows from the west to enter Ditch No. 2 without scouring. The lateral (No. 2a) along the west edge of the properties that front James Street to the west will also be deepened.

c. The lateral (No. 3a) along the east edge of the properties that front James Street to the east will be deepened. This lateral will outlet into Ditch No. 3 just below drop structure No. II.

d. The outlet channel (Ditch No. 4) from the main culvert under the railroad to the Barge Canal will be enlarged.

5. A pumping plant located at the main culvert under the railroad will be used to pump irrigation water into the ditch system. Part of the water will be piped 3,600 feet through a 12-inch diameter underground pipeline to the diversion at James Street and there released into the ditch system. The remainder would be put into the ditch system immediately above the water control structure at the pump. This will allow the water to be taken from the ditch system where needed. The pumping plant would have a maximum capacity of 5,500 gallons per minute.

Additional studies will need to be made in future planning to firmly establish the most economical and effective irrigation pumping and distribution system.

These works of improvement will provide adequate agricultural drainage, 10-year flood protection, and sufficient irrigation for the entire 620 acres of cleared muckland as well as the additional 65 acres which is expected to be cleared after the project measures are installed.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

The total cost of the works of improvements is estimated to be $602,200, of which $425,450 will be from Public Law 566 funds, and $176,750 will be paid for by the local sponsoring organization. The estimated cost and distribution of costs is shown in Tables II and III. Cost allocation and cost-sharing details are shown in Table IV.

Operation and maintenance of this project was estimated as being 2 percent of the cost of construction not including the cost of the large culvert.

Cost estimates made in this study were based upon the use of $1 per cubic yard for channel excavation, $150 per cubic yard for concrete, and $2,000 per cubic foot per second of water pumped for the cost of a pumping plant. Volume estimates were based upon limited survey cross-sections and a topography map of the area. The cost estimate of the culvert under the railroad was based upon information obtained from suppliers.

Costs for pumping and other aspects of the irrigation system are based on limited information obtained for this study. More detailed studies during the planning phase of the project will firm up the final costs for irrigation. It is expected that these will provide an even more favorable benefit cost ratio.

Ditch Nos. 1, 2, 2A, 3A, and 4 and that part of Ditch No. 3 which serves both flood protection and drainage were allocated in accordance with the first method shown in the Watershed Protection Handbook, Chapter 3, Paragraph 103.0221. The diversion and irrigation system only serve flood prevention and irrigation respectively; therefore, no allocation of costs were necessary. Local sponsors are responsible for 100 percent of the land rights costs for all purposes. Federal funds must bear 100 percent of the construction and engineering costs allocated to flood prevention. Federal funds may bear up to 50 percent of the construction cost and all of the engineering costs allocated to drainage and irrigation. Local sponsors must bear at least 50 percent of the construction cost allocated to drainage and irrigation. The sponsors and the Service must each bear the project administration costs they incur for these purposes.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENTS

The installation of land treatment and structural measures will provide an effective flood prevention and agricultural water management program (drainage and irrigation) for the watershed. The combined measures will afford benefits on 685 acres of poorly drained land.

The plan provides for an approximate 10-year frequency level of protection against flood damages to crops. Floods which occur less frequently will continue to inundate large portions of the muckland; however, the inundation will be for a much shorter duration which will significantly reduce the probability of crop losses.

Adequate drainage outlets will be provided by the project installation. Landowners and operators can construct and maintain structures for drainage with the assurance that excess water will flow off their land. Drainage improvements in this area will allow a more intensive utilization of the production factors of land, labor, capital, and management. Under existing conditions, farm operators must maximize the use of these inputs during short periods of time when favorable conditions prevail. Under project conditions, the use of these inputs can be effectively maintained over longer periods of time.

Installation of the project will allow more efficient farm operations which in turn should be achieved through the use of larger fields, longer rows, and fewer turnrows. The cost of production should also decrease as a result of fewer trips over the land in seedbed preparation, less frequent replanting, smaller expenditures for weed and grass control, and fewer difficulties in harvesting.

The project will eliminate restrictions in the choice of land use due to wet conditions, thereby enabling the farm operators to adopt a more diversified cropping system.

Farm operators on the muckland will be able to choose either subsurface or sprinkler irrigation systems. Both methods will maintain soil moisture at an optimum level for crop growth, uniform germination of seeds and prevention of wilting of transplants. In addition, this irrigation will increase the quality and quantity of the products grown. Where sprinkler irrigation is used, the loss of the muck soil, newly planted seed and young plants will be minimized.

No adverse effects on the fish and wildlife resources will be caused by the project.

The average annual benefits accruing to the structural measures included in the plan (Table VI) amount to $90,890. The annual primary benefits of $79,775 include flood prevention, $38,460, drainage $24,365, and irrigation $16,950. Secondary benefits are estimated to be $11,115.

Average annual floodwater damages will be reduced from $40,482 to $6,072 by the proposed project, an 85 percent reduction. Additional benefits will be derived from the installation of land treatment.

The estimated average annual cost of the structural measures (amortized installation cost plus annual operation and maintenance cost) is $39,410.

Benefits compared to cost and expressed as a ratio are 2.3:1.0 (see Table VI). All purposes of this project have a favorable benefit cost ratio.

ALTERNATE OR ADDITIONAL POSSIBILITIES

Other possibilities were considered until it became obvious they would not be economically feasible. At the time, costs of each alternative were discovered to exceed benefits, further study was terminated. These alternatives included using three culverts, using a culvert under James Street, and not using a diversion. The possibility of using a pumping plant for drainage was studied, but due to the high installation cost, and high operating cost, it was not recommended.

There may be a possibility of installing a pumping plant to serve the both purposes of irrigation and flood control. This alternative will warrant consideration by the local sponsors.

TABLE 1b - STRUCTURE DATA

Rome Muck Subwatershed, Oswego River Basin

Item	Watershed Area	Needed Capacity	Estimated Volume Concrete	Drop	Remarks
	(sq. mi.)	(cfs)	(cu.yds.)	(ft.)	
Drop Structure I	2.2 1/	178 2/	36	6	Type "B" Drop Spillway
Drop Structure II	1.2	220 2/	36	5	Type "B" Drop Spillway
Main Culvert	4.2	406 3/	-	-	108" Dia. CMP
Waterlevel Control	4.2	406 3/	-	-	To be attached to inlet at main culvert
Irrigation System	-	12 4/	-	-	Pump and pipeline distribution system 5/

1/ The State Ditch takes some of the flow.
2/ 10-year frequency flow.
3/ B drainage.
4/ Irrigation requirement peak discharge.
5/ 5,500 gpm pump with 12 inch diameter underground pipeline 3,600 feet long. Pipeline would carry approximately one-half the pump capacity.

February 1970

TABLE III - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Rome Muck Subwatershed, Oswego River Basin

(Dollars)[1/]

Structural Measures	Installation Cost					
	Construction	Engineering Services	Project Administration	Land Rights	Administration of Contracts	Total
Diversion	56,500	5,100	10,200	2,900	1,100	75,800
Ditches 1,2,2A,3A,4	128,100	11,500	23,100	42,600	2,600	207,900
Ditch 3	49,600	4,500	8,900	26,600	1,000	90,600
Drop Structure I	6,600	600	1,200	200	100	8,700
Drop Structure II	6,600	600	1,200	200	100	8,700
Main Culvert	108,000	9,700	19,400	1,000	2,200	140,300
Water Level Control	9,700	900	1,700	200	200	12,700
Irrigation System	41,000	3,700	7,400	4,600	800	57,500
TOTAL	406,100	36,600	73,100	78,300	8,100	602,200

Price Base: 1969

February 1970

TABLE IV - COST ALLOCATION AND COST SHARING SUMMARY

Rome Muck Subwatershed, Oswego River Basin

(Dollars) 1/

Item	Cost Allocation				Cost Sharing							
	Purpose				Public Law 566				Other			
	Flood Prev.	Drainage	Irrig.	Total	Flood Prev.	Drainage	Irrig.	Total	Flood Prev.	Drainage	Irrig.	Total
Diversion	64,500			64,500	61,600			61,600	2,900			2,900
Ditches 1,2, 2A,3A,4	91,100	91,100		182,200	69,800	37,775		107,575	21,300	53,325		74,625
Ditch 3	61,300	19,400		80,700	41,100	7,050		48,150	20,200	12,350		32,550
Drop Struct.I	3,700	3,700		7,400	3,600	1,950		5,550	100	1,750		1,850
Drop. Struct.II	5,600	1,800		7,400	5,450	950		6,400	150	850		1,000
Main Culvert	59,350	59,350		118,700	58,850	31,850		90,700	500	27,500		28,000
Water Level Control	5,400	5,400		10,800	5,300	2,875		8,175	100	2,525		2,625
Irrig. System			49,300	49,300			24,200	24,200			25,100	25,100
Subtotal	290,950	180,750	49,300	521,000	245,700	82,450	24,200	352,350	45,250	98,300	25,100	168,650
Project Administration				81,200				73,100				8,100
GRAND TOTAL	290,950	180,750	49,300	602,200	245,700	82,450	24,200	425,450	45,250	98,300	25,100	176,750

1/ Price Base: 1969

February 1970

TABLE V - ANNUAL COST

Rome Muck Subwatershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Amortization of 2/ Installation Cost	Operation and Maintenance Cost	Total
Number I	25,340	5,140	30,480
Diversion Ditches 1,2,2A,3,3A,4 Drop Structure I & II Main Culvert Waterlevel Control			
Number II	2,650	1,920	4,570
Irrigation System			
Project Administration	4,360		4,360
GRAND TOTAL	32,350	7,060	39,410

1/ Price Base: Installation 1969, O&M Long Term
2/ Fifty years @ 4-7/8 percent interest

February 1970

TABLE VI - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

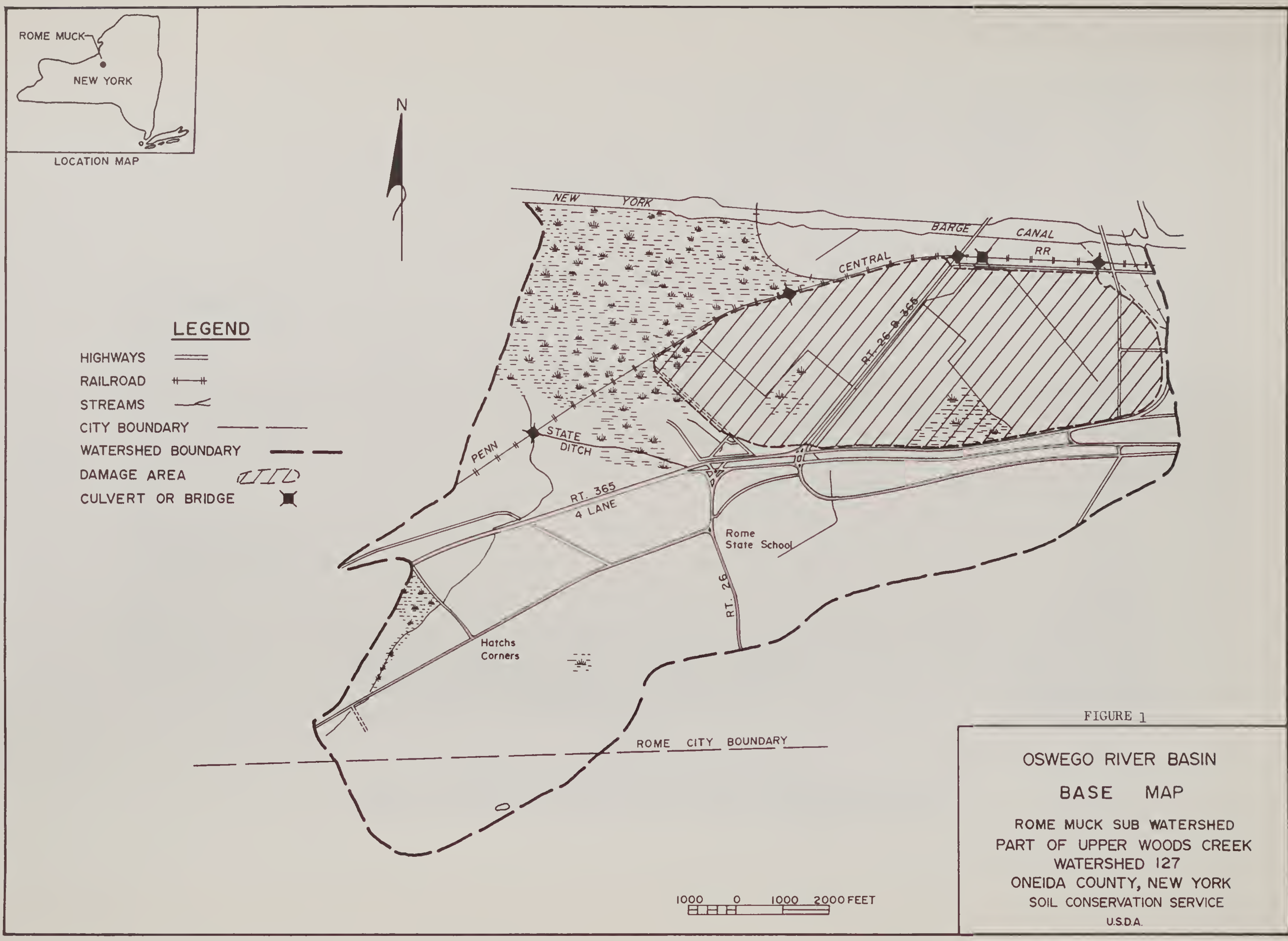
Rome Muck Subwatershed, Oswego River Basin

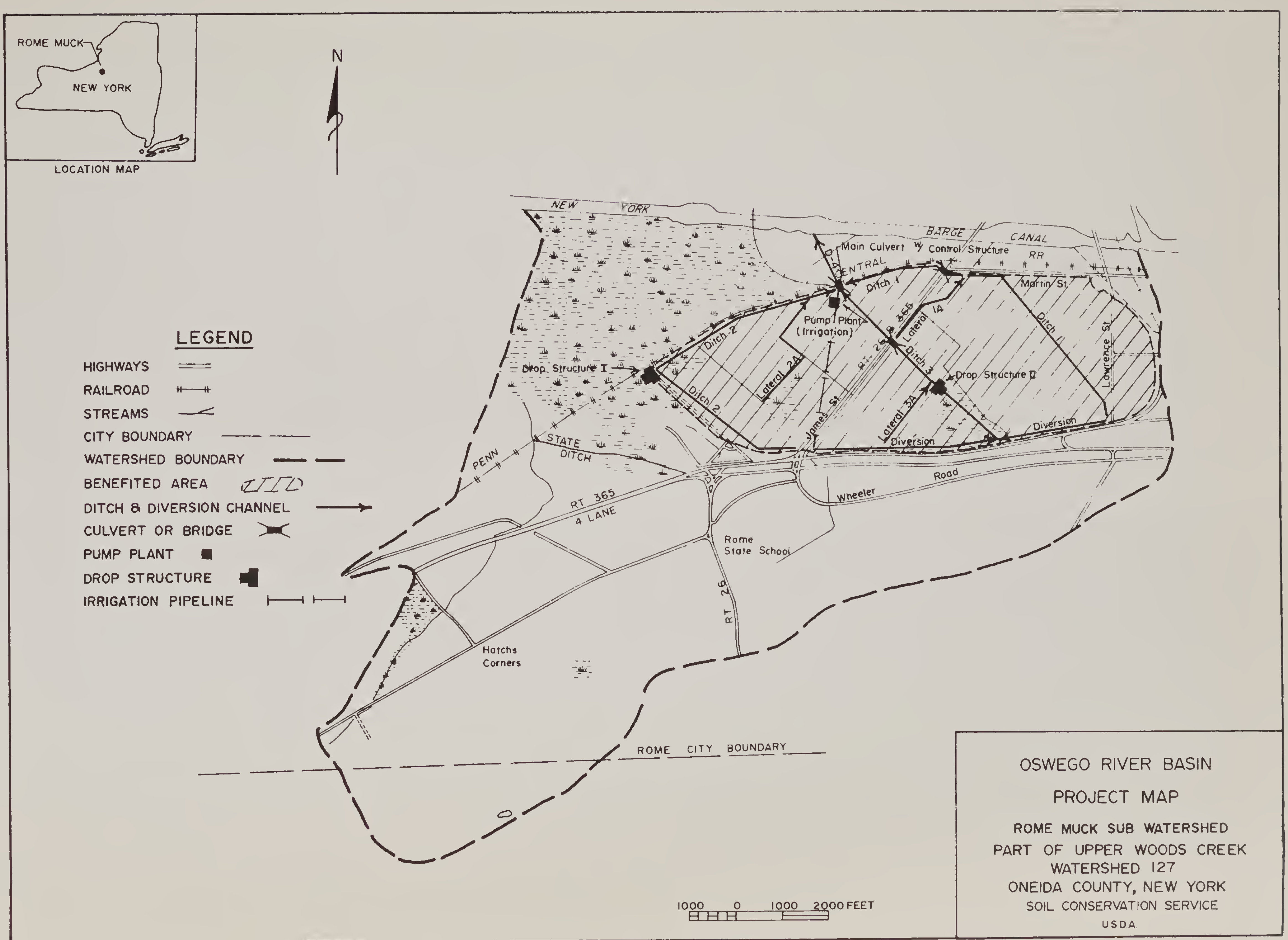
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/							Average Annual Cost 2/	Benefit Cost Ratio
	Floodwater Prevention				Agric. Water Mgt.				
	Damage Reduction	Changed Land Use	Drainage	Changed Land Use	Irrigation	Secondary	Total		
Number I	34,410	4,050	21,800	2,565	-	9,420	72,245	30,480	2.4:1
Diversion Ditches 1,2,2A,3,3A,4 Drop Structures I & II Main Culvert Waterlevel Control									
Number II	-	-	-	-	16,950	1,695	18,645	4,570	4.1:1
Irrigation System									
Project Administration	-	-	-	-	-	-	-	4,360	-
GRAND TOTAL	34,410	4,050	21,800	2,565	16,950	11,115	90,890	39,410	2.3:1

1/ Price Base: 1969
2/ From Table V

February 1970


ROME MUCK
NEW YORK
LOCATION MAP
N
LEGEND
HIGHWAYS
RAILROAD
STREAMS
CITY BOUNDARY
WATERSHED BOUNDARY
DAMAGE AREA
CULVERT OR BRIDGE
NEW YORK BARGE CANAL
CENTRAL RR
RT. 26 & 365
PENN
STATE DITCH
RT. 365
4 LANE
Rome
State School
RT. 26
Hatchs
Corners
ROME CITY BOUNDARY
1000 0 1000 2000 FEET
OSWEGO RIVER BASIN
BASE MAP
ROME MUCK SUB WATERSHED
PART OF UPPER WOODS CREEK
WATERSHED 127
ONEIDA COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
U.S.D.A.
FIGURE 1



ROME MUCK
NEW YORK
LOCATION MAP
N
LEGEND
HIGHWAYS
RAILROAD
STREAMS
CITY BOUNDARY
WATERSHED BOUNDARY
BENEFITED AREA
DITCH & DIVERSION CHANNEL
CULVERT OR BRIDGE
PUMP PLANT
DROP STRUCTURE
IRRIGATION PIPELINE
NEW YORK BARGE CANAL
CENTRAL RR
Main Culvert W/ Control Structure
Martin St
Ditch 1
Ditch 2
Ditch 3
Lateral 1A
Lateral 2A
Lateral 3A
Pump Plant (Irrigation)
Drop Structure I
Drop Structure II
James St
Lawrence St
RT 26 & 365
Diversion
PENN
STATE DITCH
RT 365 4 LANE
Wheeler Road
Rome State School
RT 26
Hatchs Corners
ROME CITY BOUNDARY
1000 0 1000 2000 FEET
OSWEGO RIVER BASIN
PROJECT MAP
ROME MUCK SUB WATERSHED
PART OF UPPER WOODS CREEK
WATERSHED 127
ONEIDA COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
USDA

SIX MILE CREEK SUBWATERSHED INVESTIGATION REPORT

Tributary of Oneida River - Watershed No. 426

Western New York Type IV River Basins

Oswego River Basin

Oswego County, New York

December 1970

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service   Economic Research Service   Forest Service

SIX MILE CREEK SUBWATERSHED INVESTIGATION REPORT

Oswego River Basin
Oswego County, New York
December 1970

THE WATERSHED IN BRIEF

Six Mile Creek subwatershed is located in Oswego County, 4.2 miles north of the village of Phoenix in the north-central part of the Oswego River Basin. The subwatershed drains an area of 27.9 square miles (17,900 acres) into the Oneida River. Nearby urban areas are Syracuse, 18 miles southeast; Fulton, 6 miles west; and Oswego 15 miles north. The watershed is in Land Resource Area L-101, the Ontario Mohawk Plain of the Lake States Fruit, Truck and Dairy Region.

Topography is dominated by drumlins scattered throughout the otherwise flat watershed. Elevations range from 365 msl at the confluence with the Oneida River to 530 msl near Drakes Corners in the northern part of the watershed. Many of these flat areas are underlain by lacustrine soils of the Rhinebeck-Madalin Association which have potential for agriculture production. Most of the 425 acres of muck soil in the Beaver Meadow are over 3 feet deep.

Upland soils on the drumlins are glacial tills of the Ontario and Sodus Associations and lake-laid soils of the Granby Association. The Ontario and Sodus soils have a high agricultural potential. The Granby soils have a good potential for vegetable crop production when drained, but undrained their potential for agricultural use is poor.

Approximately 60 percent of the subwatershed is open. Of this, 30 percent of the subwatershed is cropland, including 425 acres of muckland; 20 percent is in pasture; and 10 percent is in idle land, roads and farmsteads. The Beaver Meadow muckland on Bell Creek is intensely cropped with onions and lettuce and some minor acreage of other vegetables. Upland farm enterprises are generally confined to dairying and only support crops for this enterprise are grown. Approximately 10 owners farm the muckland compared with 200 farms in the upland areas.

The forest land is all privately-owned and the hydrologic condition is considered average. The forest land is predominantly hardwood and consists of northern hardwoods and ash-elm-red maple. There are several small softwood plantations in the upper part of the watershed. Forest products consist of small quantities of sawlogs and firewood.

Mean annual rainfall in the Six Mile Creek area is about 36 inches which yields about 24 inches of runoff annually. Distribution of the precipitation is fairly uniform throughout the year. Approximately 16 inches of rainfall can be expected during the 170 day growing season. The average temperature, during the growing season, is 68°. Prevailing winds from the southwest cause erosion in the mucklands during dry periods.

The completion of new Route 57, approximately one-half mile west of the subwatershed will make this area more accessible for future growth and use.

Six Mile Creek contains a good quality brown trout fishery from Gilbert Mills Road upstream two miles. This section of stream receives an annual stocking of yearling trout to supplement natural reproduction. Bell Creek contains no fishery.

WATERSHED PROBLEMS AND NEEDS

The major problems of the subwatershed are overbank flooding of the mucklands, lack of water for irrigation, and lack of water-based recreation facilities. Other problems such as wind erosion of the muckland, water erosion, and sediment accumulation exist in the subwatershed, but are not as serious.

The overbank flooding of the muckland causes approximately $80 per acre damage annually. Average annual floodwater damage to the crops on the 425 acres of muckland is $34,000. Damages include loss of product; increased cost of production; decrease in quality of products; decreased yields; and reduced profit due to restricted choice of the type of crop.

The entire 425 acres of muckland and more than 600 acres of upland soils have potential for irrigation. Irrigation is needed to control wind erosion, seed losses, and seedling damages. In addition, it will increase the quality and quantity of the products grown.

Water-based recreation is not available in the subwatershed. Recreation of this type would complement the local golf course and attract people into the area for recreation purposes.

Wind erosion of the muckland occurs during periods of dryness as few protective measures such as windbreaks to control this type of erosion are present. The rate of subsidence and amount of muck soil lost through wind erosion is not known.

PHYSICAL POTENTIAL FOR MEETING NEEDS

The subwatershed needs of flood control, irrigation, and recreation can be solved by constructing a multipurpose site and improving sections of the Bell Creek channel. The best potential site, No. 426-3, is located on Bell Creek just above Biddelton Road. Water for beneficial uses of recreation and irrigation can be stored in this site in addition to that required for floodwater storage. The channel can be enlarged and deepened and still have an outlet into the Oneida River.

Pumping irrigation water from the Oneida River to the mucklands was considered, but appears to be unfeasible due to the high cost involved. A possible site for single purpose recreation is located on Six Mile Creek, just above Gilbert Mills Road. This site is small and would not provide any floodwater control benefits for the muckland. However, this is on the section of stream containing the trout fishery and would create a trout fishing lake.

The soils and topography in the subwatershed are such that the proper land treatment measures will improve hydrologic conditions thereby reducing erosion and sediment damage.

LOCAL INTEREST IN PROJECT DEVELOPMENT

Local muckland owners have requested, through the Oswego County Soil and Water Conservation District, an evaluation of the subwatershed for its potential as a PL-566 project.

The Eastern Oswego Regional Water Resources Planning Board is presently developing a plan for the Eastern Oswego River Basin which includes the Six Mile Creek subwatershed. This Board is provided technical assistance through the Division of Water Resources, New York State Department of Environmental Conservation.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

Land Treatment

Application of recommended conservation practices on cropland includes conservation cropping systems, cover crops, tile drains, water control systems and windbreaks. Practices recommended on grassland include planting or renovation, fencing, rotation grazing and stockwater ponds.

Hydrologic stand improvement and intermediate cutting is needed in most of the larger pole and poor sawtimber stands.

Technical assistance is available to the county planning board, local community leaders, and developers in multiple use planning on private, nonindustrial lands in the subwatershed. Technical assistance can be provided to developers for on-site plans to minimize the deterioration of hydrologic balance and resulting erosion by the maintenance of vegetative cover during development. Urban developers will also be encouraged to utilize the natural landscape in their planning.

Structural Measures

The recommended structural measures for meeting the needs of the subwatershed are one multipurpose reservoir site No. 426-3 and 4.1 miles of channel improvement. Channel improvement on Bell Creek will extend from the upper end of the mucklands to a point in Peter Scott Swamp

approximately one-half mile above the confluence with the Oneida River.

A 35-foot high dam will store approximately 4,500 acre-feet of beneficial water, creating a 380 acre lake. Four hundred fifty acre-feet can be stored for irrigation and the remainder is available for recreation. The withdrawal of the small quantity of irrigation water as compared with the total amount stored will lower the water level less than one foot and will, therefore, have little effect on the recreation values of the impoundment.

The irrigation water is expected to be used on the mucklands. If other lands are irrigated, more water will have to be allocated to that use. The watershed yield is approximately 3,200 acre-feet per year. It is estimated that one acre-foot of water stored can irrigate one acre per year. This water can be applied at a rate of 10 gpm per acre.

Basic facilities needed for recreation will be installed around the pool area. Warm water fishery can be installed in the reservoir. The site was designed to store the expected 100-year sediment accumulation and to temporarily store the floodwaters from a 100-year frequency storm and release this water at a controlled rate. A more detailed geologic investigation will be needed to verify the water-holding ability of the site. The preliminary studies indicated the presence of permeable deposits in both abutments.

The channel is designed to carry the discharge from the site and from a 10-year frequency storm on the uncontrolled area, within banks. A check was made to insure that this channel would carry the flow determined from the *B* drainage curve contained in the Soil Conservation Service's *National Engineering Handbook* with the hydraulic gradient approximately two feet below the surface of the mucklands. This depth is needed to provide the required drainage outlets. The bridges at Barnard Road, Route 264, and Route 54 will have to be underpinned when the channel is deepened.

The irrigation water will be released into the main channel where the operators can pick it up with their sprinkler pumps and convey it to the point of use.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

To provide a basis for the design and cost estimate, limited field surveys were made. The surveys included a centerline profile of the site and cross-sections on the channel above and below the bridges and other locations along the channel through the muck area and outlet. U.S. Geological Survey 7 1/2 minute topographic maps were used for the stage-storage computations and horizontal control for the channel surveys.

The estimated installation cost for the proposed works of improvement is $1,723,000. This cost estimate was determined by using the following unit costs: $0.75 per cubic yard for channel excavation and $200 per cubic yard for concrete. (See tables II, III, and IV.)

Federal funds must bear 100 percent of the construction and engineering cost allocated to flood prevention. Federal funds may bear up to 50 percent of the construction cost and all of the engineering cost allocated to irrigation and recreation. Also, federal funds may bear up to 50 percent of the land rights cost allocated to recreation. Local sponsors must bear at least 50 percent of the construction cost allocated to irrigation and recreation. Local sponsors are responsible for 100 percent of the land rights costs not allocated to recreation and 50 percent of the land rights costs allocated to recreation.

The sponsors and the Service must each bear the project administration costs they incur for these purposes. The use-of-facilities method was used for allocation of cost to purpose.

Annual operation and maintenance of the works of improvement is expected to be 0.5 percent of the construction cost of the site; 2 percent of the construction cost for the channel; and 3 percent of the construction cost for the recreation facilities plus $0.10 per user day annually.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

Installation of land treatment and structural measures will provide flood prevention, irrigation, and recreation for the subwatershed. The combined measures will afford benefits on 425 acres of mucklands and the adjacent uplands.

The plan provides for a 10-year frequency level of protection against flood damages to crops. Floods which occur less frequently will continue to inundate large portions of the mucklands; however, the inundation will be for a much shorter duration significantly reducing crop losses.

Water problems experienced in the Six Mile Subwatershed are similar to three watersheds that have been studied and planned in detail. Average annual crop damage in these watersheds are approximately $80 per acre. Ten year protection reduces the damages by 85 percent. Average annual benefits are $80 x .85 x 425, or $28,900. Of this, approximately 5 percent is provided by land treatment measures. Average annual benefits from reduction in damages provided by the site and channel improvement are $27,500.

Farm operators will be able to use sprinkler irrigation systems to minimize the loss of muck soil, newly planted seed, and young plants. The net benefits of $30 per acre for irrigation allows for the cost incurred by the operators in pumping the water from the main channel to their farms.

Recreation benefits were computed assuming that swimming, picnicking, and fishing would be the major uses of the recreation facilities. Annual user days were estimated to be 133,000 and a user day was valued at $1.50. Total estimated average annual recreation benefits are $199,500.

Secondary benefits are estimated to be 10 percent of the primary benefits or $24,050 per year. Benefits compared to cost and expressed as a ratio are 2.1:1.0. (See Table VI.) All purposes of this project have a favorable benefit cost ratio and are justified.

ALTERNATE OR ADDITIONAL POSSIBILITIES

Other possibilities were considered for solving the subwatershed problems such as using just channel improvement or a single purpose site and channel improvement. In each case, the alternative did not solve all the problems and did not have a favorable benefit cost ratio.

Site No. 426-3 has been evaluated at the maximum development. Further studies may indicate the desirability of lesser development for recreation and/or irrigation, in which case the cost and benefits would decrease. Present policy limits the federal cost-sharing of cost allocated to recreation, to 30 percent of the total PL-566 cost.

TABLE Ia - STRUCTURE DATA

Six Mile Creek Subwatershed, Oswego River Basin

Site Number	Drainage Area (sq.mi.)	Est. Height of Dam (feet)	Est. Vol. of Fill (cu.yd.)	Principal Spillway: Type	Principal Spillway: Release Rate (csm)	Emergency Spillway: Type	Emergency Spillway: % Chance of Use	Max. Surface Area Emergency Spillway Level (acres)
426-3	5.1	35	114,000	R.C.Conduit	28	Veg.	1.0	550

December 1970

TABLE Ib - RESERVOIR STORAGE CAPACITY

Site Number	Drainage Area (sq.mi.)	STORAGE CAPACITY PLANNED: Sediment	Detention	Subtotal Flood Prev.	Recreation	Irrigation	Total	Additional Storage Capacity Available (acre feet)
		(Acre Feet) (inches equiv.)						
426-3	5.1	140(0.5)	710(2.6)	850(3.1)	4040(14.9) 1/	450(1.7)	5340(19.7)	0

1/ Surface area of recreational pool - 380 acres.

December 1970

TABLE Ic - CHANNEL DATA

Channel Designation	Length of Reach (mi.)	Watershed Area (sq.mi.)	Needed Channel Capacity (cfs) 1/	Bottom Width (ft.)	Depth (ft.)	Velocity in Channel (ft./sec.)	Estimated Volume of Excavation (cu.yds.)
Main Channel-Bell Creek	4.1	9.17	575	50	5.1	1.91	272,500

1/ 10-year frequency discharge.

December 1970

TABLE II - ESTIMATED STRUCTURAL COST-POTENTIAL DEVELOPMENT

Six Mile Creek Subwatershed, Oswego River Basin

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) 1/
STRUCTURAL MEASURES			
Construction			
Multipurpose Site	No.	1	305,000
Recreation Facilities	No.	1 2/	379,000
Channel Improvement	Mi.	4.1	259,000
Subtotal - Construction			943,000
Engineering Services			84,000
Project Administration			170,000
Land Rights			507,000
Administration of Contracts			19,000
TOTAL STRUCTURAL MEASURES			1,723,000

1/ Price Base: 1969
2/ This is the minimum amount of facilities considered necessary to support the estimated 133,000 annual users.

December 1970

TABLE III - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Six Mile Creek Subwatershed, Oswego River Basin

(Dollars) 1/

Structural Measures	Installation Cost					Total
	Construction	Engineering Services	Project Administration	Land Rights	Administration of Contracts	
Multipurpose Site	305,000	27,000	55,000	286,000	6,000	679,000
Recreation Facilities	379,000	34,000	68,000	180,000	8,000	669,000
Channel Improvement	259,000	23,000	47,000	41,000	5,000	375,000
TOTAL	943,000	84,000	170,000	507,000	19,000	1,723,000

1/ Price Base: 1969.

December 1970

TABLE IV - COST ALLOCATION AND COST-SHARING SUMMARY

(Dollars) 1/

Item	Cost Allocation				Cost Sharing							
	Purpose				Public Law 566				Other			
	Flood Prev.	Irrig.	Recr.	Total	Flood Prev.	Irrig.	Recr.	Total	Flood Prev.	Irrig.	Recr.	Total
Multiple purpose site	52,000	28,000	538,000	618,000	52,000	15,000	279,500	346,500	-	13,000	258,500	271,500
Recreation facilities			593,000	593,000			313,500	313,500			279,500	279,500
Channel improvement	323,000			323,000	282,000			282,000	41,000			41,000
Subtotal	375,000	28,000	1,131,000	1,534,000	334,000	15,000	593,000	942,000	41,000	13,000	538,000	592,000
Project Administration				189,000				170,000				19,000
GRAND TOTAL	375,000	28,000	1,131,000	1,723,000	334,000	15,000	593,000	1,112,000	41,000	13,000	538,000	611,000

1/ Price Base: 1969.

December 1970

TABLE V - ANNUAL COST

Six Mile Creek Subwatershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Amortization of 2/ Installation Cost	Operation and Maintenance Cost	Cost
Multi-Purpose Site Recreation Facilities Channel Improvement	85,640	31,350	116,990
Project Administration	10,550	-	10,550
GRAND TOTAL	96,190	31,350	127,540

1/ Price Base: Installation 1969. O&M adjusted current-normalized prices.
2/ Fifty years at 5-1/8 percent interest

December 1970

TABLE VI - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Six Mile Creek Subwatershed, Oswego River Basin

(Dollars)

Evaluation Unit	Average Annual Benefits 1/					Average Annual Cost 3/	Benefit Cost Ratio
	Damage Reduction	Irrigation	Recreation	Secondary	Total		
Multi-Purpose Site Recreation Facilities Channel Improvement	27,500	13,500	199,500	24,050	264,550	116,990	2.3:1
Project Administration						10,550	
GRAND TOTAL	27,500 2/	13,500	199,500	24,050	264,550	127,540	2.1:1

1/ Price Base: 1969
2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $1,400 annually
3/ From Table V

December 1970


W/S 426
NEW YORK
LOCATION MAP
Drakes Corner
Bell
Volney
3
49
Farley Corners
Emery
Road
Mills Road
Old
Railroad
Grade
Road
Creek
Barnard
Road
264
Peter
Scott
Swamp
1
0
1 Mile
Scale
LEGEND
WATERSHED BOUNDARY
ROADS
STATE ROUTES
264
STREAMS
SITE 426-3
BENEFITED AREA
CHANNEL IMPROVEMENT
OSWEGO RIVER BASIN
PROJECT MAP
SIX MILE CREEK
TRIBUTARY OF ONEIDA RIVER
WATERSHED 426
OSWEGO COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
USDA

BLACK CREEK SUBWATERSHED INVESTIGATION REPORT

TRIBUTARY OF LOWER OSWEGO RIVER - WATERSHED NO. 433

Western New York Type IV River Basins

Oswego River Basin

Oswego County, New York

August 1970

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service   Economic Research Service   Forest Service

BLACK CREEK SUBWATERSHED INVESTIGATION REPORT

TRIBUTARY OF LOWER OSWEGO RIVER - WATERSHED NO. 433
Oswego River Basin
Oswego County, New York

August 1970

THE WATERSHED IN BRIEF

Black Creek is located in central Oswego County. It drains 31.4 square miles (20,100 acres) and flows into the Oswego River about 1.5 miles north of the city of Fulton and opposite Battle Island State Park. The subwatershed is part of the Lower Oswego River Watershed No. 433. It lies in Land Resource Area L-101, the Ontario-Mohawk Plain of the Lake States Fruit, Truck, and Dairy Region.

This glaciated area is characterized by long drumlincid ridges generally trending in a north-south direction. The soils are in the Sodus-Ira Association, are generally low in fertility, and are derived from glacial till and lake sediments, with frequent swamps and developed muckland lying between the ridges. Bedrock, usually thinly bedded sandstones, may be near the surface or exposed in the stream beds in some places. Three small bodies of water - Mud Pond, Crooks Pond, and Paddy Pond are located in the watershed.

Black Creek flows generally east to west, alternately paralleling and then passing through gaps in the ridgelines. Several small tributary streams draining the intervals join the creek in a more or less trellis pattern.

Approximately 50 percent (10,100 acres) of the watershed is in forest cover, all of which is privately owned. About one-half of the forest land consists of ash-elm-red maple which is growing on poorly drained soils. The larger blocks of forest land are located in the eastern half of the drainage. Smaller blocks of forest land and woodlots, consisting of northern hardwoods are found throughout the watershed.

There are no urban areas in the watershed. About 25 percent (5,000 acres) of the area is in grassland cover, pasture and hayland or recently idle. Cropland, including the intensively cultivated developed mucklands, makes up about 10 percent (2,000 acres) of the watershed. Cropping on the muckland by about 20 farmers is principally in lettuce (70 percent) and onions (30 percent). Dairy farming was formerly the major land use in the watershed. Today few active farms remain in the watershed other than the muckland truck farming operations. Idle and miscellaneous uses cover the remaining 15 percent (3,000 acres).

The numerous scattered wetlands, small woodlands and extensive idle land provide good habitat for woodcock, rabbits, grouse, and deer.

Of the 15.5 miles of Black Creek which is in private ownership, 2.5 miles in the upper reaches are trout waters. Major fish species present are brook trout, brown trout, rock bass, sunfish, suckers, and various minnows. There is some natural brook trout reproduction which is supplemented with annual stocking of yearling brown trout in the stream between Mud Pond and Crooks Pond. Much of the stream between Crooks Pond and Whitaker Road has been excavated in the past to provide better drainage on the adjacent muck cropland. This has destroyed the natural fish habitat that once existed in this reach of Black Creek.

The three small lakes are all privately owned and have several summer homes and cottages located on the shores. All have warm water species of fish including yellow perch, bullheads, northern pike, black crappies, sunfish, large mouth bass, suckers, carp, and shiners. Mud Pond has a 52 acre surface area, Crooks Pond 38 acres, and Paddy Pond 46 acres.

WATERSHED PROBLEMS AND NEEDS

There are approximately 400 acres of developed muckland in the reach between Crooks Pond and Whitaker Road which are subject to flooding. In addition, there are some small, isolated tracts of developed muckland on tributary streams, usually individually owned, with minor flooding problems.

The creek channel does not have adequate capacity to contain the 10-year storm runoff from the 18.75 square miles above Whitaker Road. About 60 percent, or 240 acres, of the principal mucklands are flooded by such an event. Average annual damages based on net income are esti-

mated to be $26,700. One operator has built a low dike parallel to the creek and has two pumps to provide some drainage during flood peaks. These dikes are built of excavated muck placed on muck and are unstable and unreliable.

Irrigation is used to a limited extent. Irrigation water is generally obtained from farm ponds. Flood protection will provide greater opportunity to increase its use in crop production.

Forest land problems are related primarily to areas that are producing below their potential and to overcutting in immature sawtimber stands. Approximately 50 percent of the present forest land is producing below its potential due to inadequate stocking and stand conditions. In addition, idle lands reverting to forest cover are poorly stocked with undesirable tree species.

Erosion problems are principally associated with the developed muckland. Sheet erosion, due to wind as well as water, needs to be controlled.

At present, Black Creek is classified as D waters for fishing. This indicates low quality for trout; some pollution present. State fish biologists have recommended upgrading the classification on all or part of this stream to a classification of CT, or suitable for trout.

PHYSICAL POTENTIAL FOR MEETING NEEDS

The existing channel has sufficient gradient so that an adequate outlet is available if the channel bottom is lowered.

Examination of the area showed no feasible floodwater retention sites which would provide measurable floodwater control downstream or irrigation water storage. Sites 433-1 and 433-3 were studied. They are described in the *Preliminary Upstream Reservoir Studies of the Oswego River Basin, Western New York River Basin Study*. Each would flood out developed muckland and would have little effect on flooding. The natural storage found in the numerous swamps already provides most of the potential benefits that could be derived by flood retarding storage.

To maintain and improve forest land watershed benefits, continued fire protection is basic and essential. In addition, hydrologic stand improvement practices, including tree planting, are necessary on a large portion of the forested areas to establish and maintain favorable stocking and stand conditions. Sawtimber stands need protection from overcutting. These measures would ameliorate fundamental soil and water conservation problems and contribute to future timber supplies.

The soils and topography of the subwatershed are such that the proper land treatment will give protection from erosion. Many soils will respond to the addition of irrigation water and the land is capable of producing greater yields.

LOCAL INTEREST IN PROJECT DEVELOPMENT

There has not been any organized effort to develop a project in this watershed at present. The Oswego County Soil and Water Conservation District assists landowners in the district. The Eastern Oswego Regional Water Resources Planning Board is presently developing a plan for the Eastern Oswego River Basin which includes the Black Creek Subwatershed. This Board with their technical arm, the Division of Water Resources of the New York State Department of Environmental Conservation, is aware of this problem and is planning to include Black Creek in their comprehensive water resource plan.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

The most feasible alternative for solving the floodwater and water management problems in the Black Creek muck areas is 8,900 feet of channel improvement from just below Crooks Pond to a point approximately 1,300 feet below Whitaker Road. Grade stabilization structures are required at the outlets of Paddy Pond and Crooks Pond to prevent degradation of channels and maintain present water levels in the ponds. A drop structure is required on the main channel just below Paddy Ridge Road. These structures are included to protect and maintain fisheries and other environmental values. A water level control structure is required to be installed just above Whitaker Road.

The bridges over the channel on Paddy Ridge Road and Whitaker Road will have to be replaced. The length of the channel improvement is 8,900 feet. The structural measures are listed in

Table Ib. These will provide 10-year flood protection for the 240 acres of mucklands adjacent to the creek in this reach.

The land treatment measures need to be applied to the muckland concurrently with the structural measures. Windbreaks and winter cover cropping to reduce wind erosion and drainage land grading, tile, irrigation water management and structures for water control are involved on the muckland. Grassland management on hayland and pasture land, conservation cropping, systems on the remaining cropland will provide the needed watershed protection.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

The total cost of the structural works of improvement is estimated to be $273,200. Of this amount, $191,300 would be from PL-566 funds, and $81,900 would be paid by the local sponsoring organizations. The estimated cost and distribution of costs are shown in Tables II and III. Cost allocation and cost-sharing details are shown in Table IV.

The operation and maintenance for the potential structural measures is estimated to be $2,700. Life of the project is estimated at 25 years. This considers the continuing subsidence of the muck. All costs are allocated to flood protection.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

The main purpose of this project is flood prevention, while drainage improvement is incidental. Land treatment measures will protect the muckland and permit maximum utilization and returns from this resource.

It appears that channel improvement between Whitaker Road and Crooks Pond will have little effect on the fishery in Black Creek. This section of the creek is not presently stocked with trout. The water level control structures planned for Paddy Pond and Crooks Pond will maintain the present water levels in these small lakes and will therefore have no adverse effect on the warm water fishery.

This project will provide 10-year flood protection. Average annual benefits are estimated to be $24,200. Secondary benefits at 10 percent,or $2,400 are estimated to accrue for a total benefit of $26,600. Remaining average annual damage potential from floods greater than the 10-year level is estimated to be $2,500.

The estimated average annual cost of the project is $21,850 for the 25-year life of the project.

The benefit cost ratio is 1.2 to 1.0 (see Table VI).

ALTERNATE OR ADDITIONAL POSSIBILITIES

The other alternate solution to the flood problem is for the landowners adjacent to the main channel to build dikes and install pumps to control the water levels on the mucklands by individuals or small groups of landowners. Assistance for the design of these systems can be obtained through the going program of the Oswego Soil and Water Conservation District. Some financial assistance may be available through the Agricultural Conservation Program of the Agricultural Conservation and Stabilization Service of the United States Department of Agriculture, including use of pooling agreement.

With a change in classification of Black Creek to CT (trout waters), there may be a potential for improving trout habitat with pool digging, log dams, deflectors, and bank cribbing. Should detailed investigation reveal that channelization will destroy any trout habitat, mitigation could be accomplished by improving other reaches of the stream at a cost of approximately $8,000 to $10,000 per mile of stream. Diking the muck areas would not affect the stream if the borrow is not taken from the channel.

TABLE Ia - CHANNEL DATA

Black Creek Subwatershed, Oswego River Basin

Channel Designation	Length of Reach	Watershed Area	Needed Channel Capacity	Bottom Width	Depth	Velocity in Channel	Estimated Volume of Excavation
	(ft.)	(sq.mi.)	(cfs)	(ft.)	(ft.)	(ft./sec.)	(cu. yds.)
Main Channel	8,900	18.75	562 1/	14	8.4	2.53	87,280

1/ 10-year frequency

August 1970

TABLE Ib - STRUCTURE DATA

Black Creek Subwatershed, Oswego River Basin

Item	Watershed Area	Needed Capacity	Channel Area	Remarks
	(sq. mi.)	(cfs) 1/	(sq.ft.)	
Grade Stabilization Structure I	13.0	315	250	
Grade Stabilization Structure II	14.6	348	250	
Drop Structure III	13.8	330	250	
Water Level Control Structure IV	18.0	542	250	

1/ 10-year frequency

August 1970

TABLE II - ESTIMATED STRUCTURAL COST-POTENTIAL DEVELOPMENT

Black Creek Subwatershed, Oswego River Basin

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) 1/
STRUCTURAL MEASURES			
Channel Improvement	Ft.	8,900	78,600
Water Control Structures	No.	4	72,000
Subtotal Construction			150,600
Engineering Services			13,500
Project Administration			27,200
Land Rights			78,900
Administration of Contracts			3,000
TOTAL STRUCTURAL MEASURES			273,200

1/ Price Base: 1969

August 1970

TABLE III - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Black Creek Subwatershed, Oswego River Basin

(Dollars) 1/

Structural Measures	Installation Costs: Construction	Engineering Services	Project Administration	Land Rights	Administration of Contracts	Installation Cost
Channel Improvement	78,600	7,000	14,200	76,900	1,600	178,300
Water Control Structures	72,000	6,500	13,000	2,000	1,400	94,900
TOTAL	150,600	13,500	27,200	78,900	3,000	273,200

1/ Price Base: 1969

August 1970

TABLE IV - COST ALLOCATION AND COST-SHARING SUMMARY

Black Creek Subwatershed, Oswego River Basin

Item	Cost Allocation		Cost Sharing			
	Purpose		Public Law 566		Other	
	Flood Prevention	Total	Flood Prevention	Total	Flood Prevention	Other
Channel Improvement	162,500	162,500	85,600	85,600	76,900	76,900
Water Control Structures	80,500	80,500	78,500	78,500	2,000	2,000
Subtotal	243,000	243,000	164,100	164,100	78,900	78,900
Project Administration		30,200		27,200		3,000
GRAND TOTAL	243,000	273,200	164,100	191,300	78,900	81,900

1/ Price Base: 1969

August 1970

TABLE V - ANNUAL COST

Black Creek Subwatershed, Oswego River Basin

(Dollars) 1/

Evalaution Unit	Amortization of 2/ Installation Cost	Operation and Maintenance Cost	Total
Number I			
Channel Improvement Water Control Structures	17,030	2,700	19,730
Project Administration	2,120	-	2,120
GRAND TOTAL	19,150	2,700	21,850

1/ Price Base: Installation 1969, O&M Long Term
2/ Twenty-five years at 4-7/8 percent interest

August 1970

TABLE VI - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

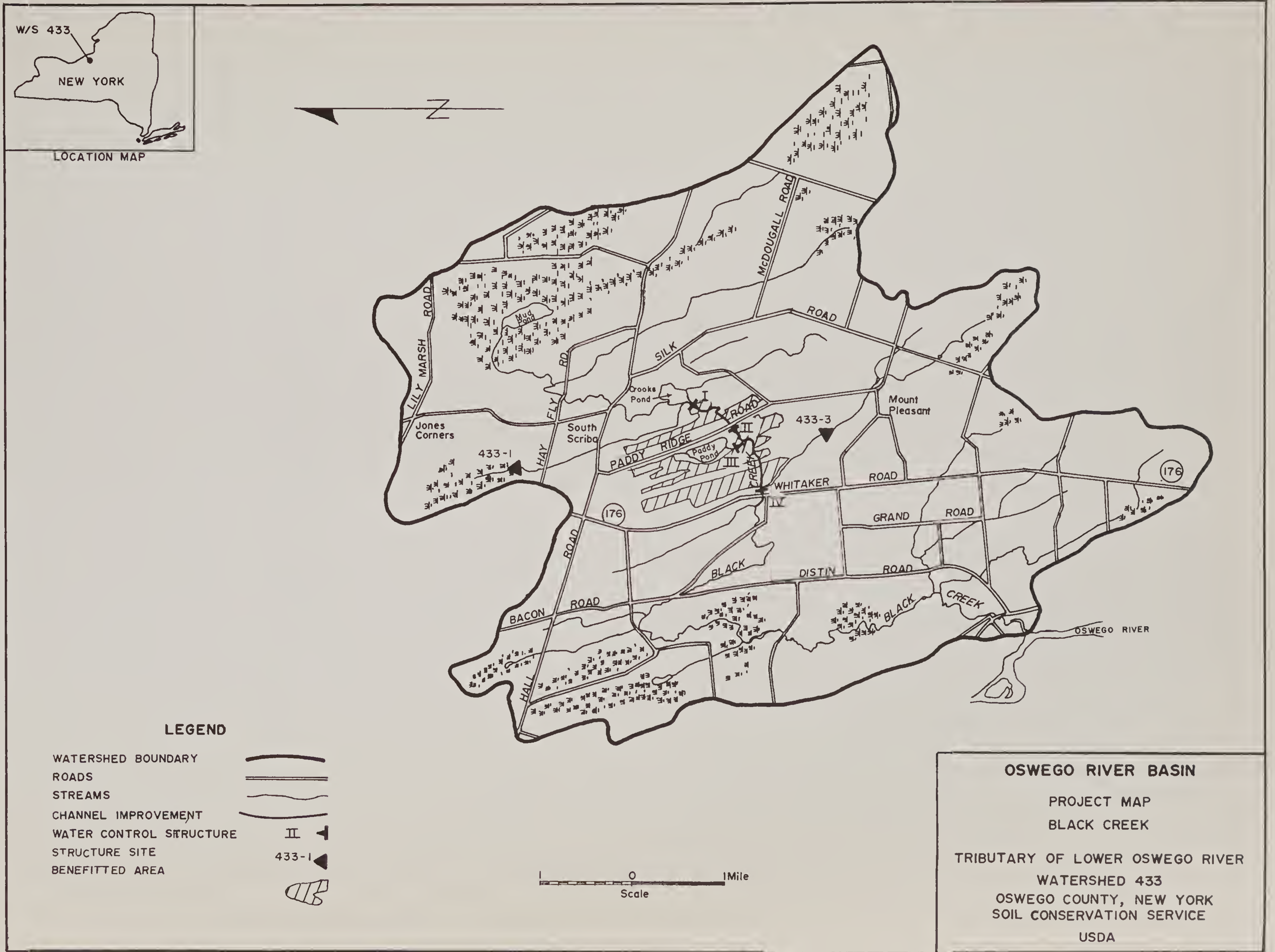
Black Creek Subwatershed, Oswego River Basin

(Dollars)

Evaluation Unit	Average Annual Benefits 1/			Average Annual 2/ Cost	Benefit Cost Ratio
	Damage Reduction	Secondary	Total		
Number I					
Channel Improvement Water Control Structures	24,200	2,400	26,600	19,730	1.4:1
Project Administration				2,120	
GRAND TOTAL	24,200	2,400	26,600	21,850	1.2:1

1/ Price Base: 1969
2/ From Table V

August 1970


W/S 433
NEW YORK
LOCATION MAP
N
LILY MARSH ROAD
Jones Corners
433-1
HAY
FLY
RD
South Scriba
Mud Pond
SILK
ROAD
McDOUGALL ROAD
Crooks Pond
PADDY RIDGE ROAD
Paddy Pond
I
II
III
IV
CREEK
433-3
Mount Pleasant
WHITAKER
ROAD
176
GRAND
ROAD
BLACK
DISTIN
ROAD
BACON
ROAD
HALL
BLACK
CREEK
OSWEGO RIVER
LEGEND
WATERSHED BOUNDARY
ROADS
STREAMS
CHANNEL IMPROVEMENT
WATER CONTROL STRUCTURE
II
STRUCTURE SITE
433-1
BENEFITTED AREA
1
0
1 Mile
Scale
OSWEGO RIVER BASIN
PROJECT MAP
BLACK CREEK
TRIBUTARY OF LOWER OSWEGO RIVER
WATERSHED 433
OSWEGO COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
USDA

WINE CREEK SUBWATERSHED INVESTIGATION REPORT

LOWER OSWEGO RIVER - WATERSHED NO. 433

Western New York Type IV River Basins

Oswego River Basin

Oswego County, New York

May 1970

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service Economic Research Service Forest Service

WINE CREEK SUBWATERSHED INVESTIGATION REPORT

LOWER OSWEGO RIVER - WATERSHED NO. 433
Oswego River Basin
Oswego County, New York

May 1970

THE WATERSHED IN BRIEF

Wine Creek is a subwatershed of Watershed 433, Lower Oswego River and is drained by Wine Creek and Harbor Brook. These two streams drain a total area of 8.3 square miles (5,300 acres) and are located entirely within Oswego County immediately east and south of the city of Oswego (population 22,200 in 1960).

The watershed is in the Land Resource Area L-101, Ontario-Mohawk Plain of the Lake States Truck, Fruit and Dairy Region. Topography consists of numerous north-south oriented drumlin hills which parallel the Oswego River and influence the drainage. This area is underlaid at varying depths by essentially horizontal sandstone bedrock. Extensive level areas of muckland and poorly drained lake-bottom soils lie between the ridges. Muckland areas totaling 385 acres about 7 percent of the watershed, have been cleared, drained, and developed for intensive vegetable production, principally lettuce and onions. Commercial farming on the adjacent upland makes up about 10 percent of the area. About 50 percent of the watershed is now idle and reverting to forest vegetation. Forest land of northern hardwoods and ash-elm-red maple occupy 20 percent of the watershed. The major part of the forestland is contiguous and lies between the ridges drained by Harbor Brook. The remainder is scattered throughout the watershed in small blocks, several of which are small softwood plantations. The remaining 13 percent of the watershed is in urban and miscellaneous uses.

There is no existing fishery in the watershed. These streams are intermittent in nature and have previously been dredged. The idle land and land reverting to forestland provide good cover for small game. There are many areas of moist intermittent stream beds and wet pockets that are lined with alders. Such cover normally supports good populations of cottontail rabbits, and woodcock. There are a few deer and some pheasants in the area.

WATERSHED PROBLEMS AND NEEDS

Problems identified in the watershed are flooding of the muckland during the cropping season, lack of irrigation water, lack of water based recreation facilities, lands producing below their potential and urban expansion into the watershed.

The drainage system appears adequate for present subsurface drainage of the muckland and with anticipated subsidence expected over the next 25 years. However, the capacity of the drainage system is inadequate to convey flood runoff from uplands through the muckland without flooding.

Outcrops of bedrock in the outlet stream channels act as a natural barrier. Gradual subsidence of the muckland surface upstream of these barriers has the effect of reducing the capacity of the channel so that flooding occurs more frequently. This flooding damages crops of lettuce and onions, limits early planting, causes delayed harvest, and interferes with normal timing of some cultural practices such as sprays or cultivation.

Floodwater damages in the reaches downstream of the mucklands are low. This is due principally to the narrow flood plain and low intensity of land use in areas subject to flooding. Reduced runoff peaks have resulted from the channel constrictions and natural storage provided in the mucklands.

Floodwater damages to the muckland crops are estimated to be $60 per acre annually, using net income method. This amounts to an average annual damage of $23,000. Present nonagricultural damages are small on an annual basis.

Supplemental irrigation would increase crop quality and yields on the 385 acres of muckland now in intensive vegetable production. This need is expected to increase once the flood threat is reduced.

Water based recreation and fish and wildlife development could be utilized by the residents of the city of Oswego and the local area even through Lake Ontario and several state parks are nearby.

Approximately 75 percent of the present forestland is producing below its potential due to inadequate stocking and stand conditons. In addition, idle lands reverting to forest cover are poorly stocked with undesirable tree species predominating.

Urban expansion from the city of Oswego is taking place in the lower half of the watershed. Existing stands of trees and other vegetation are not being fully utilized in the development of this area for sight and sound buffer zones, infiltration zones, enhancement of environmental and aesthetic values, etc., thus causing a deterioration in the hydrologic conditions of these lands.

No other significant problems or needs were found in the watershed.

PHYSICAL POTENTIAL FOR MEETING NEEDS

The only apparent solution to the flooding problem of Wine Creek is improvement of existing channels in each of the two nearly equal acres of muck. The channels have sufficient grade so that they can be improved.

Four potential reservoir sites were located in the watershed for possible flood retention and/ or recreation, fish and wildlife, and irrigation. The sites have very little storage capacity and their location and drainage areas do not provide significant flood prevention capabilities or outstanding potential for recreation development. The attached watershed map shows the location of these potential sites.

Soils in the watershed have the capability to produce fair to good stands of timber and other agricultural products.

Local planning boards that can recommend land use changes are in existence.

LOCAL INTEREST IN PROJECT DEVELOPMENT

A request for watershed evaluation was submitted by the Soil Conservation Service representative. An engineering plan for improving the channel of Wine Creek was prepared in early 1966 by the Soil Conservation Service and the Oswego County Soil and Water Conservation District, but the work was not completed. Farmers are now united and are interested in proceeding in 1970.

The Eastern Oswego Regional Water Resource Planning Board is presently developing a plan for the Eastern Oswego River Basin. This Board is provided technical assistance through the Division of Water Resources of the New York State Conservation Department.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

Land Treatment

A continuing program of technical assistance to landowners provided by the Oswego County Soil and Water Conservation District, and the New York State Conservation Department, Division of Lands and Forests, emphasizes proper land use, management, and application of conservation practices to protect and improve all land. Recommended conservation practices on agricultural land would include conservation cropping systems, tile drains, windbreaks, and stockwater ponds.

On forestland hydrologic stand improvement and intermediate cutting is needed in most of the larger pole and poor sawtimber stands to improve stand vigor and growth, and to favor a residual stand of valuable commercial trees and soil building species.

Technical assistance is available to the County Planning Board, local community leaders, and developers in multiple use planning on private, nonindustrial lands in the watershed. Assistance of this type is needed to retain and improve for watershed protection, the optimum amounts of cover on acres being planned for urban use. Technical assistance can be provided to developers for on-site plans to minimize the deterioration of hydrologic balance and resulting erosion by the maintenance of vegetative cover during development. Urban developers will also be encouraged to utilize the natural landscape in their planning.

Structural Measures

Improvement of existing channels is proposed for conveying flood flows: (1) from the southern muck area to Harbor Brook which empties into the storm sewer system of the city of Oswego, and (2) from the northern muck area using Wine Creek as an outlet. The watershed map shows the proposed channel improvement.

The southern section of channel improvement requires widening and deepening 13,000 feet of channel to a bottom width of 8 feet for a drainage area of 816 acres.

The increase in peak flows induced by the channel improvements will be insignificant when the flow reaches the inlet of the sewer system.

The northern section of channel improvement requires widening and deepening 14,700 feet of channel. The bottom width would be 18 feet for the drainage area of 1,269 acres.

The channel below the improved section is deeply entrenched all the way to its confluence with Lake Ontario. All of the bridges have the needed capacity to pass the peak flows.

The proposed design would lower the hydraulic gradient in these channels to accommodate for further subsidence in the muck. To do this, some rock excavation will be required in each outlet channel, immediately downstream from the muck.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

To provide a basis for the designs, limited field surveys were made. The surveys consisted of cross-sections of the channels and culverts. USGS 7-1/2' topographic maps were used for horizontal control for the channel surveys and to measure the drainage areas. Table I lists design details of the proposed channels.

Design capacity was based on a 10-year level of flood protection and checked to insure adequate outlets to provide "b" drainage to the muck. Bridge and culvert openings were considered in relation to the design capacity requirements. Lowering and/or replacing existing culverts under highways is included as land rights costs estimated to be $100,600. Velocities in the channels are based on soil type or rock as determined from field examination.

Volume estimates of earth and rock excavation were calculated from plotted survey cross-sections and distances scaled from USGS topographic maps. Cost estimates were made on earth excavation and spreading spoil at $1 per cubic yard and rock excavation and disposal of $4 to $8 per cubic yard.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

Existing channels are capable of passing the drainage of the muckland, but not the additional upland runoff; therefore, all costs are allocated to flood prevention.

Annual direct benefits accruing through protection from a 10-year level of occurrence are estimated to be $22,000. Indirect benefits in the form of increased business, added wages, etc., are estimated, at 10 percent of direct benefits, to be $2,200. Secondary benefits are estimated to be $2,000. Total average annual benefits are estimated to be $24,200. Remaining average annual damage potential from storms greater than the 10-year level are estimated to be $1,000.

A project life of 25 years has been planned, taking continuing subsidence of the muckland into consideration. The freeboard, or difference between the muck surface and the design high water will be reduced annually as a natural occurrence, until present conditions will be repeated.

Under present conditions, increased flows in Wine Creek will not result in significant damages. To prevent future losses, zoning of the narrow flood plain to limit encroachments should be seriously considered for adoption by the city of Oswego.

Preliminary cost estimates of channel improvement are $285,700. Amortization of 4-7/8 percent interest yields a cost of $20,020 per year. Operation and maintenance estimated at one percent of construction cost is $1,500 per year. Total annual cost is estimated to be $21,520.

Benefit-cost ratio is 1.2 to 1.

ALTERNATE OR ADDITIONAL POSSIBILITIES

Channel improvement for the northern portion of the muck was designed along the existing channels which is in the center of the muck area. A new channel could be constructed along the east side of the muck area for approximately the same cost, except for land rights and loss of productive land. The channel in this location could intercept the runoff from the upland before it crossed any muck. Rock excavation will also be required in the outlet of this section of the channel.

Other alternatives considered but found to be impractical were: (a) a diversion over Deer Ridge for the southern channel and (b) a division of the flow in the southern channel. By dividing the flow in the southern channel, the rock excavation can be reduced, but the increased flow in the northern section would increase the cost of that channel improvement.

No additional muckland is available for development.

The four sites suggested for flood control and/or irrigation supply reservoir sites were reviewed. Site Nos. 1 and 2 are not located above the flooded areas and therefore have no flood control potential. Site Nos. 3 and 4, tributary to the muckland, have drainage areas too small to have a significant effect on flood reduction or provide an adequate and dependable irrigation supply. Site Nos. 1 and 2 are too distant to be economically developed for irrigation water supply. Distribution costs requiring pumping against a minimum 50 foot elevation head would be very high as well. Individual development of small sites by landowners, or wells and storage pits may offer a more realistic source.

The four sites are all too small to have sufficient fish and wildlife benefits to justify installation as single purpose reservoirs. Site No. 1 involves a considerable part of a city waste disposal land fill area which lowers its quality for recreation development as well as reducing the volume of storage. This area is entirely within the city of Oswego, and has a high value for commercial development. Dam installation costs would be high in relation to the area and volume capacity of the site, due to the extreme length of fill required. Detailed design and cost estimates were not made at this time.

The proximity of Lake Ontario, the Oswego River, and the high percentage of "wild" or undeveloped land in the region results in a less urgent need for fish and wildlife as well as recreation developments within this small watershed on a project basis. There are four state parks within 20 miles of the city of Oswego which offer a large variety of recreation facilities.

TABLE I - CHANNEL DATA

Wine Creek Watershed, Oswego River Basin

Channel Designation	Length of Reach	Watershed Area	Needed Channel Capacity	Bottom Width	Depth	Velocity in Channel	Estimated Volume of Excavation
	(ft.)	(acres)	(cfs)	(ft.)	(ft.)	(ft./sec.)	(cu. yds.)
Wine Creek (Northern Section)	14,700	1,269	118	18	4.0	2.96	60,000
Harbor Brook (Southern Section)	13,000	816	91	8	4.8	1.67	29,700

May 1970

TABLE II - ESTIMATED STRUCTURAL COST-POTENTIAL DEVELOPMENT

Wine Creek Watershed, Oswego River Basin

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) 1/
STRUCTURAL MEASURES			
Construction			
Channel Improvement			
Wine Creek (Northern Section)	Ft.	14,700	89,500
Harbor Brook (Southern Section)	Ft.	13,000	54,000
Subtotal Construction			143,500
Engineering Services			12,900
Project Administration			25,800
Land Rights			100,600
Administration of Contracts			2,900
TOTAL STRUCTURAL MEASURES			285,700

1/ Price Base: 1969

May 1970

TABLE III - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Wine Creek Watershed, Oswego River Basin

(Dollars)[1/]

Structural Measures	Installation Cost					
	Construction	Engineering Services	Project Administration	Land Rights	Administration of Contracts	Total
Wine Creek (Northern Section)	89,500	8,000	16,000	62,700	1,800	178,000
Harbor Brook (Southern Section)	54,000	4,900	9,800	37,900	1,100	107,700
TOTAL	143,500	12,900	25,800	100,600	2,900	285,700

1/ Price Base: 1969

May 1970

TABLE IV - COST ALLOCATION AND COST SHARING SUMMARY

Wine Creek Watershed, Oswego River Basin

(Dollars)[1/]

Item	Cost Allocation		Cost Sharing			
	Purpose		P. L. 566		Other	
	Flood Prevention	Total	Flood Prevention	Total	Flood Prevention	Total
Wine Creek (Northern Section)	160,200	160,200	97,500	97,500	62,700	62,700
Harbor Brook (Southern Section)	96,800	96,800	58,900	58,900	37,900	37,900
Subtotal	257,000	257,000	156,400	156,400	100,600	100,600
Project Administration		28,700		25,800		2,900
GRAND TOTAL	257,000	285,700	156,400	182,200	100,600	103,500

1/ Price Base 1969

May 1970

TABLE V - ANNUAL COST

Wine Creek Watershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Amortization of 3/ Installation Cost	Operation and 4/ Maintenance Cost	Cost
Channel Improvement 2/	18,010	1,500	19,510
Project Administration	2,010	-	2,010
GRAND TOTAL	20,020	1,500	21,520

1/ Price Base: 1969
2/ Includes rock excavation
3/ Amortized 25 years at 4-7/8 percent
4/ One percent of construction cost

May 1970

TABLE VI - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

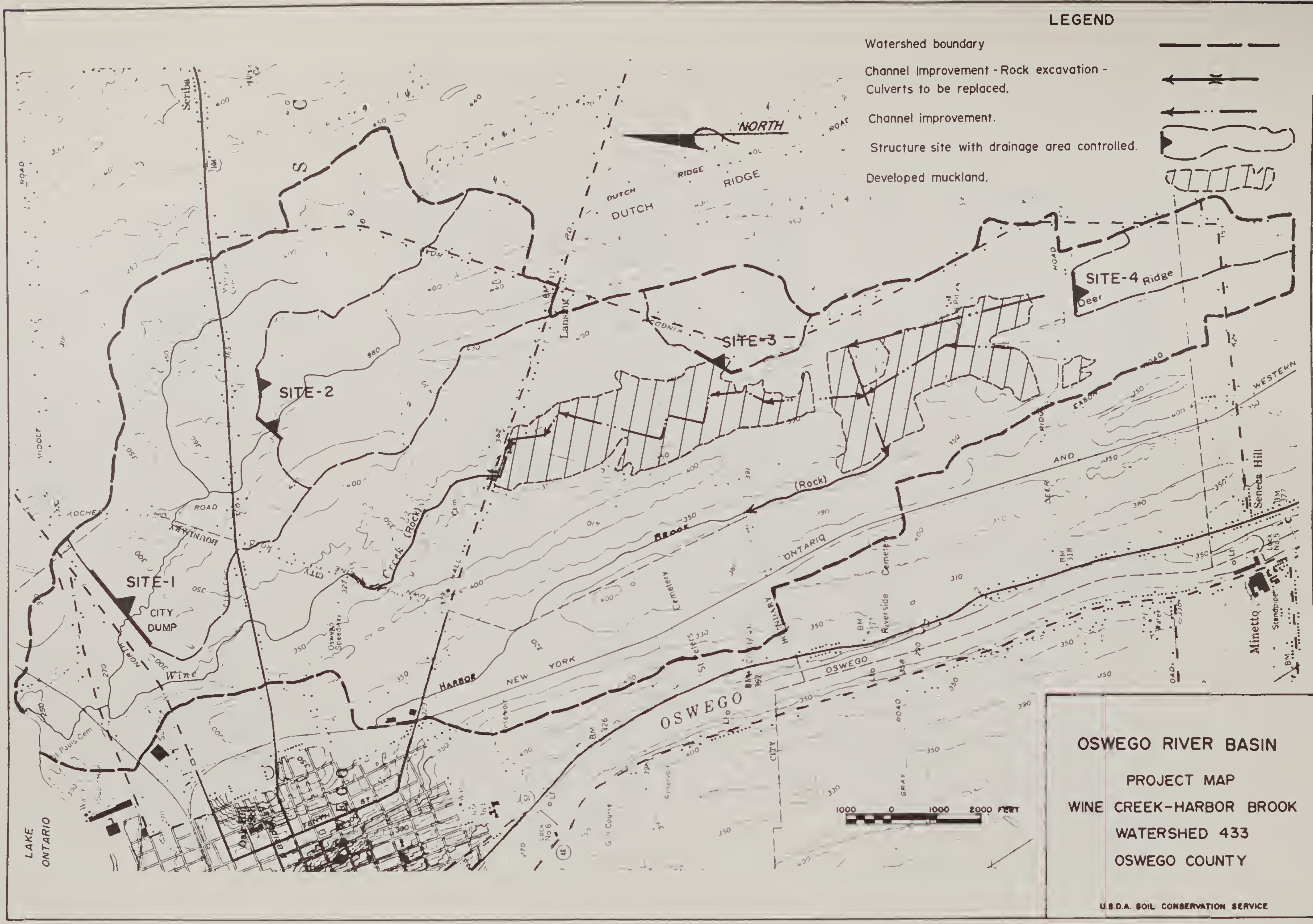
Wine Creek Watershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Average Annual Benefits 1/				Average 2/ Annual Cost	Benefit Cost Ratio
	Damage Reduction	Indirect	Secondary	Total		
Channel Improvements	22,000	2,200	2,000	26,200	19,510	1.3:1
Project Administration					2,010	
GRAND TOTAL	22,000	2,200	2,000	26,200	21,520	1.2:1

1/ Price Base: 1969
2/ From Table V

May 1970


LEGEND
Watershed boundary
Channel Improvement - Rock excavation - Culverts to be replaced.
Channel improvement.
Structure site with drainage area controlled.
Developed muckland.
NORTH
SITE-1
CITY DUMP
SITE-2
SITE-3
SITE-4
Lake Ontario
Oswego
Scriba
Lansing
Dutch Ridge
Deer Ridge
Minetto
Seneca Hill
Wine Creek
Harbor Brook
New York Ontario and Western
1000 0 1000 2000 FEET
OSWEGO RIVER BASIN
PROJECT MAP
WINE CREEK-HARBOR BROOK
WATERSHED 433
OSWEGO COUNTY
U.S.D.A. SOIL CONSERVATION SERVICE

SODUS DITCH SUBWATERSHED INVESTIGATION REPORT

TRIBUTARY OF UPPER SENECA RIVER - WATERSHED NO. 454

Western New York Type IV River Basins

Oswego River Basin

Wayne County, New York

June 1970

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service   Economic Research Service   Forest Service

SODUS DITCH SUBWATERSHED INVESTIGATION REPORT

TRIBUTARY OF UPPER SENECA RIVER - WATERSHED NO. 454
Oswego River Basin
Wayne County, New York

June 1970

THE WATERSHED IN BRIEF

Sodus Ditch, part of the Upper Seneca River Watershed No. 454, is located in Wayne County in the north central part of the state at the village of Clyde, New York (1960 population 2,640). It is midway between the urban centers of Rochester and Syracuse, 38 miles west and east respectively.

This 10.2 square mile (6,500 acre) watershed drains south into the New York State Barge Canal west of the village of Clyde. The entire project area is within Land Resource Area L-101, the Ontario-Mohawk Plain of the Lake States Fruit, Truck, and Dairy Region. Climate in the area is greatly influenced by the proximity to Lake Ontario. Average temperatures range between 65° - 70° during the 170 day growing season. Rainfall annually is about 36 inches, uniformly distributed throughout the year. An average of seventeen inches falls during the growing season from April 30 to about October 15.

Cover in the watershed is 78 percent open land and 22 percent forest land. A breakdown by land is as follows:

Land Use	Percent
Open Land	
Crop	63
Pasture, Idle, Hay	32
Urban and Other	5
Forest Land	22

Cropland dominates the land use in this subwatershed. Both cash crops such as corn, snap beans, strawberries, and wheat and support crops for the dairy industry are grown.

About 22 percent of the watershed is in forest land, all of which is privately owned. The principal forest type is ash-elm-red maple with some white oak and hickory. There are several small pine plantations scattered throughout the watershed. Forest products consist of small quantities of sawlogs and firewood.

The lower portion of Melvin Brook is warm and sluggish while the upper portion is dry. A few warm water fish inhabit the lower portion near the Clyde River. The fishery value is low.

Topography of the area is relatively flat with a few low elongated hills found around the edges. Elevations range from 525 feet msl in the north central part of the watershed to 385 feet msl at the confluence with the Barge Canal. Soils are of the Rhinebeck-Madalin Association and the Minoa-Lamson Association. Bottomland soils are generally wet because of their tightness and the flat topography.

The village of Clyde is the only population concentration in the immediate area. Very little urbanization has taken place or is anticipated in the future. Most business enterprises in the village are involved in supplying services to the surrounding farmlands.

WATERSHED PROBLEMS AND NEEDS

A combination of overbank flooding and restricted drainage are the two main problems in the watershed. Because of the similarity and complexity of these problems, it is impossible to separate the two without a more detailed study. Other problems, although minor in nature, include the lack of irrigation water, a lack of maximum utilization of the land due to an absence of land treatment.

About 3,000 acres of potentially good agricultural land are experiencing some flood damage because of the main ditches and lateral ditches are not adequate to handle excess flows. Part of this problem is caused by high water levels in the canal and a somewhat restricted

outlet - a small culvert under the railroad.

Average annual damage in the watershed is $37,000. Damages result primarily from a restricted use of all resources. This includes late planting in the spring, restricted choice of crops which can be grown, and less than optimum use of the land. The resulting crops are costly to produce and not of top quality.

More than 4,000 acres of irrigable soils are found within the watershed. The area shown in Figure 1 is the prime irrigable land which will show the most profitable return. Other land can be irrigated, but not as profitably. Because of the restricted drainage, any attempts made to irrigate have proven uneconomical. With the installation of the project measures and adequate on-farm drainage, irrigation can be effectively undertaken.

Proper management and conservation practices are needed to protect watershed values and to alter land use to productive capabilities of the soils. Low yields and poor pasture are the specific problems in the watershed.

No other significant problems and needs were found in the watershed.

PHYSICAL POTENTIAL FOR MEETING NEEDS

Main channels and culverts could be enlarged to provide the necessary floodwater protection and drainage to the limit of the 10-year, high water, backup from the Barge Canal. In a study of the watershed, it was found that topographically, only one potential floodwater retarding site could be identified. However, this site did not control enough drainage area to effectively protect the damage area.

Irrigation water is available from the Barge Canal, and from ground water sources in the extreme southern part of the watershed. The latter source is recharged by water from the Barge Canal and could be developed by individual farmers. However, a permit from the state of New York for use of water from the Barge Canal is required. Most soils in the watershed will respond to the addition of irrigation water. The land has the potential to improve hydrologically and is capable of producing greater yields of agricultural and forest products.

LOCAL INTEREST IN PROJECT DEVELOPMENT

Very little is known of local interest in the project at the present time. No consideration has been given to filing an application for PL-566 assistance. Several farmers in the area are Wayne County Soil and Water Conservation District cooperators and have made some attempts to solve the problems on their own farms, but they have had only limited success.

New York State Division of Water Resources, working through Wa-Ont-Ya Water Resources Regional Planning Board, has expressed an interest in the development of the watershed, especially the irrigation aspects. This is consistent with their program of maximum development of the water resources of the Basin.

WORKS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

Land Treatment

The continuing program of assistance to landowners provided by the Wayne County Soil and Water Conservation District and the New York State Conservation Department, in cooperation with the United States Department of Agriculture, emphasizes proper land use and the application of conservation practices to protect and improve the land.

Application of recommended conservation practices on cropland include conservation cropping systems, cover crops, land smoothing and leveling, drains (tile), and drainage mains and laterals. Practices recommended on grassland include pasture and hayland planting and renovation, rotation grazing, and stock water ponds. Recommendations for forest land include hydrologic stand improvement and intermediate cuttings in larger pole and poor sawtimber stands. Continued protection to prevent forest fire is basic and essential to derive the maximum benefits from all watershed protection measures.

Structural Measures

The most feasible and economical solution to the floodwater and drainage problems is to improve 2.2 miles of Sodus Ditch and 4.5 miles of Melvin Brook channels. Sodus Ditch would be improved from the watershed divide to its confluence with Melvin Brook. Melvin Brook and its

tributaries would be improved from Rose Valley Road to the outlet. This work would include new culverts in Melvin Brook at Rose Valley Road and Kelsey Road and a culvert in Sodus Ditch at Kelsey Road.

Table I shows the design details of the proposed 6.7 miles of channel improvement which will benefit a total of 3,000 acres.

Underpinning of the Route 31 bridge will be required due to the deepening of the channel. The culvert under the railroad would not be changed. A dike will be necessary along the east side of the channel between the railroad and the old trolley berm to prevent overland flow.

Irrigation water can be supplied to the 4,000 acres by installing a pumping plant near the outlet of Melvin Brook. Water could be pumped from the Barge Canal through a pipe line to the north-south divide on Sodus Ditch. At this point, an enclosed reservoir can be built to store the water (400 acre feet, or one-third of that annual amount required) until it is needed. The water would be released down to Melvin Brook and Sodus Ditch where it could be diverted by individual operators for their use.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

The estimated cost of these works of improvement is $1,107,000. Unit costs used in these estimated are: channel excavation - $0.75 per cubic yard; Culverts - $1 per diameter inch per foot of length; pumping plants - $2,000 per cfs pumped and land cost at $500 per acre. Limited field surveys were made to provide a basis for quantities and cost estimates. Surveys included cross-sections of the channels above and below the bridges and culverts along with a field determination of the watershed divide on Sodus Ditch. USGS 7-1/2 minute topographic maps were used for horizontal control. Channel proportions were based on discharges obtained from the "B" drainage curve contained in the Soil Conservation Service's National Engineering Handbook. This design will also provide channel capacity to carry the 10-year frequency storm.

The irrigation system is designed on the assumption that only one-half of the irrigable land (2,000 acres) would be irrigated during any one season. It was estimated that one acre-foot of water would be needed for each acre of land that would be irrigated. The pumping system was designed to pump one-third of the peak requirement of one cfs for each 50 acres irrigated. All of the remaining portion of the peak requirement flow should be taken from the reservoir. The enclosed reservoir is designed to store 400 acre-feet. This design of the reservoir pump and pipeline is the most economical combination which will provide the required amounts of water.

EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

This multipurpose project has three main purposes - flood control, drainage and irrigation. Improved water resource conditions and increased yield of agricultural and forest products will result from proper land use management and appropriate land treatment measures. The project will provide "B" drainage requirements assuming the Barge Canal is at the 10-year level. Water levels will be kept at least 18 inches below the surface of the fields. Enlargement of the main channels will allow for adequate drainage during times of excess rainfall. Additional protection of overland flow up to the 10-year event will be realized by the entire 3,000 acres.

With the project, damages will be reduced 72 percent or $26,850 annually. This will allow better use of all production resources and provide a better quality product. Since the damages are inseparable, and the allocation of costs is 50-50 for flood control and drainage, the annual benefits will be divided the same way.

Irrigation benefits for supplying water to 2,000 acres each year, will amount to $60,200 annually. This is based on a design which allows for irrigation of one-half of the available acreage each year. Maximum production and better quality of produce will result. However, these benefits of $30 per acre can only be achieved if the main channel work is accomplished.

Secondary benefits accruing from the proposed works of improvement will be $8,150.

Total annual benefits are $89,730. The B/C ratio is 1.2:1.0. All purposes are separately justified and the project will not adversely affect fish and wildife.

ALTERNATE OR ADDITIONAL POSSIBILITIES

Other possibilities were examined, but none were found for which the benefits exceeded the costs. These alternates included a structure site and a pumping plant for flood control. Neither would contribute enough to the project to justify their inclusion.

An additional 2,800 acres of land suitable for irrigation lies adjacent to the Sodus Ditch subwatershed. The irrigation system proposed in this report can be enlarged so that it can supply water to these additional acres with a very little increase in cost. Adequate drainage of this additional area will be required before maximum irrigation benefits can be realized.

TABLE Ia - CHANNEL DATA

Sodus Ditch Subwatershed, Oswego River Basin

Channel Designation	Length of Reach	Watershed Area	Needed 1/ Channel Capacity	Bottom Width	Depth	Velocity in Channel	Estimated Volume of Excavation
	(ft.)	(sq. mi.)	(cfs)	(ft.)	(ft.)	(ft./sec.)	(cu. yds.)
Sodus Ditch	11,500	2.5	137	14	7.0	0.81	30,700
Melvin Brook	24,000	7.7	376	14	10.7	1.17	123,400

1/ "B" Drainage

June 1970

TABLE Ib - STRUCTURE DATA

Sodus Ditch Subwatershed, Oswego River Basin

Item	Needed Capacity	Fill Height	Length	Estimated Volume	Remarks
	(cfs)	(ft.)	(ft.)	(cu. yds.)	
Dike		5	2,000	8,500	
Pumping Plant	15 1/				Pumping Head 200'
Pipe Line	15 1/		14,300		18" Diameter
Reservoir	400 2/ acre feet	30	3,400	364,000	Enclosed Reservoir

1/ One-third of the peak irrigation requirement
2/ One-third of the total annual volume of irrigation water needed

June 1970

TABLE II - ESTIMATED STRUCTURAL COST-POTENTIAL DEVELOPMENT

Sodus Ditch Subwatershed, Oswego River Basin

Item	Unit	Amount Planned	Estimated Total Cost (Dollars) 1/
STRUCTURAL MEASURES			
Construction			
Channel Improvement 2/	Mi.	6.7	149,000
Irrigation System 3/	No.	1	657,000
Subtotal Construction			806,000
Engineering Services			73,000
Project Administration			144,000
Land Rights			67,000
Administration of Contracts			17,000
TOTAL STRUCTURAL MEASURES			1,107,000

1/ Price Base: 1969
2/ Includes dike
3/ Includes pumping plant, pipeline and reservoir

June 1970

TABLE III - DISTRIBUTION OF STRUCTURAL COST-POTENTIAL DEVELOPMENT

Sodus Ditch Subwatershed, Oswego River Basin
(Dollars) 1/

Structural Measures	Installation Cost					
	Construction	Engineering Services	Project Administration	Land Rights	Administration of Contracts	Installat. Cost
Channel Improvements 2/	149,000	14,000	27,000	55,000	3,000	248,000
Irrigation Systems 3/	657,000	59,000	117,000	12,000	14,000	859,000
TOTAL	806,000	73,000	144,000	67,000	17,000	1,107,000

1/ Price Base: 1969
2/ Includes dike
3/ Includes a pumping plant, pipeline and reservoir

June 1970

TABLE IV - COST ALLOCATION AND COST SHARING SUMMARY

Sodus Ditch Subwatershed, Oswego River Basin

(Dollars) 1/

Item	COST ALLOCATION				COST SHARING							
	PURPOSE				P. L. 566				OTHER			
	Flood Prev.	Drainage	Irrig.	Total	Flood Prev.	Drainage	Irrig.	Total	Flood Prev.	Drainage	Irrig.	Total
Channel 2/ Improvement	109,000	109,000		218,000	81,500	44,250		125,750	27,500	64,750		42,250
Irrigation System 3/			728,000	728,000			387,500	387,500			340,500	340,500
Subtotal	109,000	109,000	728,000	946,000	81,500	44,250	387,500	513,250	27,500	64,750	340,500	432,750
Project Administration				161,000				144,000				17,000
GRAND TOTAL	109,000	109,000	728,000	1,107,000	81,500	44,250	387,500	657,250	27,500	64,750	340,500	449,750

1/ Price Base: 1969
2/ Includes dike
3/ Includes pumping plant, pipeline, and reservoir

June 1970

TABLE V - ANNUAL COST

Sodus Ditch Subwatershed, Oswego River Basin

(Dollars) 1/

Evaluation Unit	Amortization of 2/ Installation Cost	Operation and Maintenance Cost	Total
Number I Channel Improvements	11,710	3,000	14,710
Number II Irrigation System	39,100	10,700	49,800
Project Administration	8,650	-	8,650
GRAND TOTAL	59,460	13,700	73,160

1/ Price Base: Construction 1969; O&M Adjusted Normalized
2/ Fifty years @ 4-7/8 percent interest

June 1970

TABLE VI - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Sodus Ditch Subwatershed, Oswego River Basin

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/					Average Annual Cost 2/	Benefit Cost Ratio
	Damage Reduction	Drainage	Irrigation	Secondary	Total		
Number I Structural Measures	13,425	13,425		2,680	29,530	14,710	2.0:1
Number II Irrigation System			54,730	5,460	60,200	49,800	1.2:1
Project Administration						8,650	
GRAND TOTAL	13,425	13,425	54,730	8,150	89,730	73,260	1.2:1

1/ Price Base: 1969
2/ From Table V

June 1970

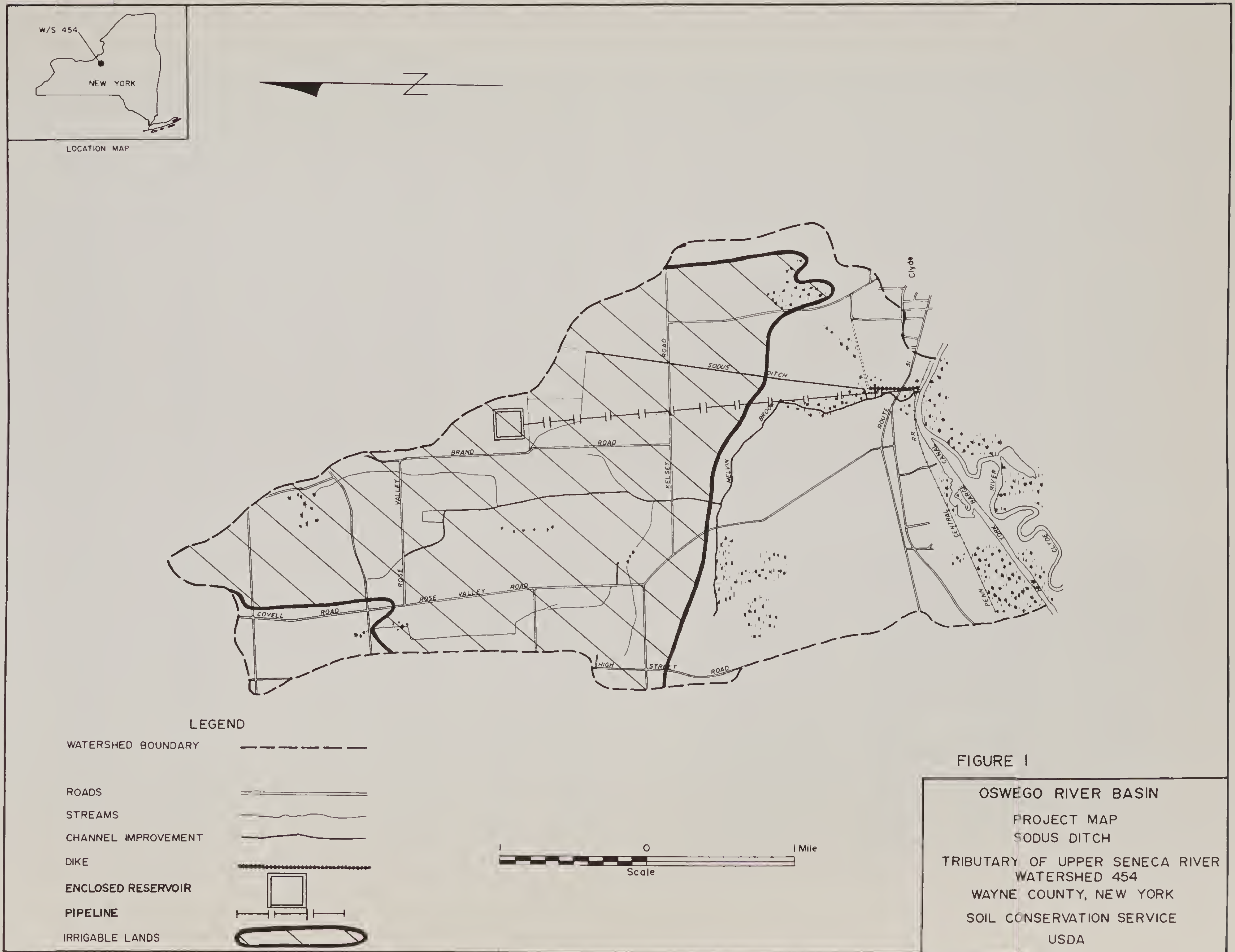


FIGURE I

OSWEGO RIVER BASIN

PROJECT MAP
SODUS DITCH

TRIBUTARY OF UPPER SENECA RIVER
WATERSHED 454
WAYNE COUNTY, NEW YORK
SOIL CONSERVATION SERVICE
USDA

FALL CREEK WATERSHED EVALUATION REPORT SUMMARY

Fall Creek watersheds 140 and 450 drain 126 square miles (80,640 acres) in Tompkins, Cayuga, and Cortland counties in the Central New York Finger Lakes Region. The creek drains into Cayuga Lake at Ithaca. Soils in the watershed have fair to good potential for agriculture with the best soils being along the flood plain.

Flooding of agricultural and urban lands has occurred within the watershed almost annually. The damages mainly are scattered along Fall Creek itself for the most part and the damages amount to $4,580 annually. However, one major damage area is found in the village of Dryden where Egypt Creek causes $4,000 annually. On Virgil Creek, damages are also scattered and amount to $1,080 annually. Sediment damages are reported to be $1,000 annually. Recreation and municipal water supply are two other important needs in the watershed.

Because of the long length of the streams with flooding problems, the existing land use in the flood plain areas, and the low potential for future development within the flooded areas, it was apparent that channel work would not be justified either as a structural measure in combination with floodwater retarding dams or as a structural measure alone. A diversion behind the elementary school would provide the needed protection for Dryden.

Two sites were selected to meet the recreation and water supply needs - 140-1 and 450-2. These two sites, plus the diversion for Egypt Creek, would cost $3,800,000. With recreation facilities and project administration added in, the average annual cost is $233,400 over the 100-year project life. Benefits accruing from the project are floodwater reduction ($4,300), incidental recreation ($270,000), and municipal water ($42,900), secondary ($31,700) and redevelopment ($19,300) for a total of $368,200 annually. This gives a benefit cost ratio of 1.6:1.0. Due to present administrative constraints, this project cannot be implemented under Public Law 566 since flood prevention is only an incidental purpose.

KASHONG CREEK TRIBUTARY SUBWATERSHED EVALUATION REPORT SUMMARY

The 8.2 square mile (5,140 acres), Kashong Creek Tributary, is located in Yates County near Penn Yan, New York. Because of the good potential of the soils for agriculture, the dominant land use is cropland and makes up 85 percent of the watershed. Cash crops such as corn, snap beans, table beets, cabbage and support crops for the dairy industry are being grown.

A lack of outlets for drainage is the principal problem in this watershed. This affects 565 acres of which 480 acres are cropland. Because of the lack of drainage, irrigation practices cannot be used.

Widening and deepening of the main tributary and lateral channels are needed. Work required includes 35,000 feet of channel improvement and a concrete drop spillway at a total cost of $260,000. This would result in an annual cost of $16,645 over the 50-year life of the project. Benefits which would be obtained from the structural works of improvement are estimated to be $2,480. This gives a benefit cost ratio of less than 0.2 to 1.0.

Outlet channel problems can be improved with group action under the Public Law 46 and Agricultural Stabilization and Conservation Service programs.

LEY CREEK SUBWATERSHED EVALUATION REPORT SUMMARY

Ley Creek, part of Onondaga Lake Watershed No. 463, drains 29.5 square miles of northeastern Onondaga County. Urban land use makes up more than 70 percent of the watershed and because of the proximity of this area to metropolitan Syracuse, this figure is expected to increase in the future. Topography is relatively flat and the soils have formed from lake-laid outwash and glacial till deposits.

Floodwater damage in the vicinity of General Motors Circle and village of East Syracuse is the main problem. Damages are mainly to industrial properties and some residential areas. The key storm of May 19, 1969, estimated to be a 6-year event, produced $136,670 in damages in these areas. Average annual damages are estimated to be $98,600. Urban expansion will

increase the flood problems of the watershed.

Since structure sites were not available in the watershed, 4.7 miles of channel improvement from Onondaga Lake upstream would be required for protection. Extensive riprap and concrete lining of parts of the channel would be required. Annual costs, including operation and maintenance, would be $226,550 as opposed to the total annual benefits of $112,100. This gives a benefit to cost ratio of 0.5:1.0. The project is not justified under Public Law 566 criteria.

Local interest in solving the flood problem is very high. Onondaga County has authorized a consulting firm to study the problem and make recommendations.

LIMESTONE CREEK WATERSHED EVALUATION REPORT SUMMARY

Limestone Creek, Watershed No. 71, drains 169 square miles (180,160 acres) of Onondaga and Madison counties. Gently rolling topography with some steep areas characterize the watershed. Flood plain soils have good agricultural potential with upland soils that vary from fair to good.

Agricultural damages were estimated at $1,560 annually and nonagricultural damages were confined mainly to road and bridge damages. Recreational needs of the area are expected to increase in the future and the demand for water-based recreation will be high.

Several sites were examined, but are too costly for flood control. Channel work required would be lengthy and thus costly. A flood control project is not justifiable. However, there are several structure sites which would be suitable for recreational development. Site 71-1 could provide 171 surface acres of water for about $1.0 million, or $6,000 per acre. Sites 71-8 and 71-13 could supply 205 acres for $2,200/acre and 1,725 acres for $2,100/acre respectively. Total costs are $450,000 for site 71-8 and $3.6 million for site 71-13. This type development cannot be carried out under the PL-566 program, but could be part of the Basin development by the Eastern Oswego Water Resources Planning Board.

MUD CREEK WATERSHED EVALUATION REPORT SUMMARY

The Mud-Ganargua Creek watershed is located in the west central part of the Oswego River Basin south of Rochester. It drains 131 square miles (83,900 acres), of Ontario and Wayne counties. Characterized by a long narrow shape, this watershed has a varying topography from relatively flat in the north and central areas, to a more rugged, hilly form in the south.

Soil associations in most of the watershed have good to very good potential for agriculture. A high proportion of the watershed is in cropland. Crops such as corn, wheat, and hay as support crops for dairying are grown.

Annual flooding occurs throughout the flood plain area. Agricultural damages are estimated to be $3,000 annually. Nonagricultural damages are low. Irrigation water needs are moderate.

Ten sites were located in the watershed, but do not control enough drainage area to be of any value for the minor flooding problems. Several of the sites have potential for multipurpose development; they are 434-12 and 434-17. No combination of sites was found which would eliminate the flood damages at reasonable cost. Channel improvement was ruled out because of the scattered locations of the benefits and the extensive amount of channel work which would be necessary.

Local interest in this project is not known although strong opposition was voiced to a large reservoir planned by the Monroe County Water Authority. The project is not justified under PL-566 authority. Action on individual sites could be taken as part of the overall Basin development formulated by the Wa-Ont-Ya Water Resources Planning Board.

NEW WOODSTOCK SUBWATERSHED EVALUATION REPORT SUMMARY

This watershed is located in the southeastern part of the Basin and drains into Limestone Creek. Topography is basically a broad, relatively flat valley floor, flanked by steep valley walls. Soils in the valley have good agricultural potential.

Flooding is caused by excess water from the hill lands surrounding the flood plain. Channel capacity is inadequate to contain runoff from both the flood plain and the hillsides. Channel improvement would benefit over 300 acres of land and would cost $65,000. However, there is a trout fishery resource in the existing channel that would be completely destroyed by the channel improvement. This fishery value is estimated to be greater than the losses from floodwater damages.

RED CREEK EAST SUBWATERSHED EVALUATION REPORT SUMMARY

Red Creek is a tributary of Ganargua Creek Watershed No. 435, and drains 22.5 square miles (14,400 acres), in Wayne County, New York. Soils in the watershed have good agricultural potential, but the drumlin topography over 50-70 percent of the area prohibits the use of much of the land for crops. Only 10 percent of the area is in cropland, 45 percent hay and pasture, 20 percent forest land, and 25 percent idle, swamp and urban.

Potatoes and onions are grown on the two muck areas in the watershed, while tree fruits, processing crops, corn, and hay are grown on the non-muck areas. Drainage is the primary problem in the watershed, both in the muck areas and along the flood plain. No significant flood damages were found. Irrigation demands are expected to be a problem if the drainage problem is solved.

Channel improvement from Smith Road to Lower Ganargua Creek, about 18,000 feet, would be required to benefit the 400 acre problem area. The cost was estimated to greatly exceed the benefits, thus no detailed analysis was made. There is no local interest in a drainage project.

SAVANNAH MUCK WATERSHED EVALUATION REPORT SUMMARY

Savannah Muck is part of the Seneca River Watershed No. 454, and drains 55.7 square miles (35,600 acres) of Wayne County. Topography is flat and the soils have good potential for agriculture.

The principal problems in the watershed are flooding of the two muckland areas, lack of drainage outlets, and wind erosion of the muck soils. Flooding and lack of drainage outlets is influenced by the New York State Barge Canal.

A system of dikes could be installed to eliminate the flooding from high flows in the canal. Pumps could then be installed to provide the drainage. No estimates of benefits and costs were made and no local interest in a PL-566 project was determined.

SECOR CREEK SUBWATERSHED EVALUATION REPORT SUMMARY

Secor Creek, part of Canandaigua Outlet Watershed No. 437, drains 7.1 square miles (4,540 acres) in Ontario County, New York. Good agricultural soils dominate this watershed which is made up of 40 percent cropland, 35 percent pasture and 25 percent forest land. Both cash crops such as corn, snap beans, cabbage and support crops for the dairy industry are grown.

The major problem in the subwatershed is the lack of outlets for drainage for about 370 acres. Occasional flooding and erosion from the uplands are other minor problems which were identified. Channel widening and deepening of 18,000 feet of main channel and two laterals will be required. Replacement of two farm bridges and the lowering of an underground telephone cable and gas line is necessary. Total installation cost is $167,000, or $13,400 annually for the 25-year project life.

Annual benefits which would be derived from the project are $1,430 from improved yields on 115 acres of cropland, changing of 60 acres of pasture to cropland - $1,800, and 25 acres of idle land to cropland - $550. Total benefits including secondary are $4,350 annually. This results in a benefit cost ratio of 0.3:1.0.

No local interest has been forthcoming in this project. Since it is not justified under PL-566 criteria, an alternate vehicle must be utilized if anything is to be accomplished. Drainage benefits for parts of the subwatershed may be obtainable through improvements under PL-46 and Agricultural Stabilization and Conservation Service programs.

SUCKER BROOK SUBWATERSHED EVALUATION REPORT SUMMARY

Sucker Brook drains 8.9 square miles (5,700 acres) of the Canandaigua Lake Watershed No. 438 in Ontario County in the Central New York Finger Lakes Region. Topographically, the area is relatively flat, and from an agricultural viewpoint, most soils have fair to good potential for agriculture. Fifty percent of the watershed is in cropland, 20 percent in urban (mainly the city of Canandaigua), and the remainder divided evenly between grassland and forest.

Out-of-bank flooding in the urban reaches of Canandaigua causes annual damages of $8,300 to basements and lawns. Inadequate channel capacity and improper maintenance are the primary cause of the flooding.

To alleviate the problem, 5,300 feet of channel improvement from just below the Pearl Street bridge to Canandaigua Lake is required. The $620,000 cost for this improvement includes 200 feet of concrete-lined channel, enlargement of the remainder of the channel, and placement of riprap liner for erosion protection. An alternate solution of diverting some of the water from Sucker Brook above North Bloomfield Road into watershed No. 437 was found to be more expensive.

Total benefits of $10,000 annually would accrue from the project. Total annual costs of $35,200, including charges for operation and maintenance, would be required to achieve 100-year protection. The benefit cost ratio is 0.3:1.0 for flood protection.

There is little local interest in the development of the project. Initiative could be taken on the part of the city of Canandaigua to properly maintain the channel. This would reduce much of the damages.

SUCKER BROOK SUBWATERSHED EVALUATION REPORT SUMMARY

Sucker Brook is part of Keuka Lake Watershed No. 440 in Yates County in the Central New York Finger Lakes Region. This steep gradient stream drains 2.39 square miles (1,530 acres) through the village of Penn Yan.

Eighty percent of the watershed is in cropland with cash crops of beans, wheat, and corn grown on fair to good agricultural soils. The remaining 20 percent is the urban area of Penn Yan and the forested uplands.

The problem is out-of-bank flooding in the urban area of Court Street. Most of the damage is to yards of residences and the grounds of Penn Yan Academy. Structural measures were considered, but would not do the job without excessive costs. Benefits were very small since the problem was one of debris. A maintenance program by the village is suggested to reduce the flood hazard.

UNION SPRINGS WATERSHED EVALUATION REPORT SUMMARY

This unnamed tributary flows into Cayuga Lake, Watershed No. 449, at Union Springs, Cayuga County. The tributary drains 2.7 square miles (1,745 acres).

The problem is primarily one of urban flooding in Union Springs. Preliminary interviews with the local residents turned up a very few damages. No agricultural damages were found. A structure site could be constructed for about $200,000 and would control 85 percent of the

drainage area. Resultant benefits would not justify this expenditure.

Local officials have cleaned up the channel and removed the debris which was the major cause of the problem. A continuing maintenance program of this type is recommended.

NEW YORK STATE BARGE CANAL FLOOD PROBLEMS RELATED TO AGRICULTURAL DAMAGES

This study was made to determine average annual agricultural damages to the area affected by the New York State Barge Canal from the outlet of Oneida Lake to Phoenix and west to the village of Lyons in Wayne County.

This is a joint study between the New York State Division of Water Resources and the U.S. Department of Agriculture - Soil Conservation Service in New York. The Division prepared the stage area inundated and stage frequency. The area inundated from the 100-year storm event is the flood plain. The Soil Conservation Service developed land use, damageable values, stage damage and frequency damage by reaches.

For evaluation purposes, the damage area was divided into four (4) evaluation units. Evaluation Unit I includes all of the damage area on Oneida River from Brewerton to Three Rivers. Evaluation Unit II includes all of the damage area on the Oswego River from Three Rivers to Phoenix. Evaluation Unit III includes all of the damage area on the Seneca River. Evaluation Unit IV includes all of the damage area on the Clyde River east of Lyons.

For more detailed study, the evaluation units were further divided into damage reaches. Unit I was divided into four (4) reaches 0-1 through 0-4. Unit II has a single reach OS-1. Unit III was divided into twelve (12) reaches numbered S-3 through S-14. Unit IV was divided into six (6) reaches, C-1 through C-6. See project map for reach locations.

Damages to agricultural land varies with respect to location within the study area. The attached table illustrates the total acres in the flood plain, average annual acres inundated, composite damageable value per acre, average annual agricultural damage per acre, and total average annual agricultural damage by evaluation units and reaches.

A study of the table reflects average annual agricultural damage as insignificant except in reaches 0-4, S-4, S-5 and C-6. In these four reaches, there is a considerable acreage of muckland. This muckland is being used very intensively in the production of high income producing vegetable crops, corn and sugar beets. Structural measures, by groups and individual landowners, have been installed to protect against frequent flooding.

Note that on the balance of the study area that generally the average annual area inundated is only slightly less than the area inundated from a 100-year frequency flood. This means that the flood hazard is so great that the land cannot be used for producing agricultural products. The floodwater damages to agricultural crops per se is nil. The real problem resulting from flooding is that a high proportion of the flood plain produces but very little economic goods.

NEW YORK STATE BARGE CANAL FLOODING STUDY
ESTIMATE OF AGRICULTURAL DAMAGES BY SELECTED REACHES

EVALUATION UNIT Reach	Description	Acres Inundated from 1% Chance of Occurrence	Average Annual Acres Inundated	Average Damageable Value Per Acre (Dollars)	Average Annual Cropland and Pasture Damage Per Acre (Dollars)	Total Average Annual Damage (Dollars)
ONEIDA RIVER	1					
0-1	Brewerton to Caughdenoy	1,090	776	.33	.20	131
0-2	Caughdenoy to Three Rivers	3,490	764	1.57	.59	396
0-3	Mud Creek	1,300	172	10.80	4.93	800
0-4	Six Mile Creek	2,120	1,776	9.52	4.36	6,200
OSWEGO RIVER	11					
OS-1	Three Rivers to Phoenix	80	67	19.67	8.89	476
SENECA RIVER	111					
S-14	Onondaga Lake to Three Rivers	1,500	1,140	.25	.12	127
S-13	Baldwinsville to Onondaga Lake	1,270	1,004	1.06	.55	488
S-12	Dead Creek	203	146	.16	.08	9
S-11	Jacks Reef to Baldwinsville	960	640	2.72	1.38	840
S-10	Cross Lake	1,720	1,216	.57	.27	328
S-9	Weedsport to Cross Lake	1,046	584	4.90	2.74	1,580
S-8	Muskrat Creek	0	0	.51	0	0
S-7	Port Byron to Weedsport	1,047	580	4.61	2.37	1,335
S-6	Mud Lock to Port Byron S. of Canal	2,500	1,580	9.22	4.82	5,920
S-5	Howland Island, Mud Pond, Spring Lake Outlet	5,240	4,800	2.88	1.44	6,760
S-4	Mays Point to Savannah-Butler	6,350	5,600	25.94	15.28	83,200
S-3	Black, Butler and Crusoe Creeks	1,850	410	4.51	2.60	1,220
CLYDE RIVER	1V					
C-6	Montezuma Marsh	2,250	1,920	9.99	4.49	6,640
C-5	Clyde Village to Mays Point	2,800	2,170	2.22	1.26	2,120
C-4	Melvin Brook and Clyde Village	510	266	4.85	3.23	840
C-3	Penn-Central RR Bridge to Melvin Brook	3,350	2,600	1.37	.86	2,180
C-2	Dublin Brook to Penn-Central RR Bridge	1,230	712	2.99	1.94	1,400
C-1	Lyons to Dublin Brook	160	111	.34	.32	33
	TOTALS	42,066	29,034			123,023

OSWEGO RIVER BASIN

NEW YORK STATE BARGE CANAL
FLOOD STUDY REACHES

SENECA RIVER, ONEIDA RIVER,
CLYDE RIVER EAST OF LYONS,
& OSWEGO RIVER TO PHOENIX

SOIL CONSERVATION SERVICE
USDA

OSWEGO RIVER BASIN - APPENDIX C

IRRIGATION

Contents

APPENDIX C – IRRIGATION

INTRODUCTION

The study of irrigation needs and the possible sources of irrigation water was made to see what the demand for water might be and where it could be supplied from. This information was needed to develop a complete water and related lands plan for the Basin. At present, there are approximately 10,000 acres being irrigated in the Basin. Over 1,000,000 acres in the Basin would respond and are potentially suitable for irrigation.

The water requirement per acre of irrigation ranges from 7 to 24 inches per year with 9 inches being about the average. To supply 9 inches to the land, it is necessary to store approximately one acre-foot for each acre to be irrigated. The additional water is needed to offset evaporation, seepage, and transportation losses.

Delineations of irrigable lands were made on soil survey field sheets. The acreage was tabulated by watershed, county, and irrigable land groups to facilitate interpretations and needed land treatment measures. Each reservoir site in the *Preliminary Upstream Reservoir Studies* was screened to determine if the site would be feasible to construct as a single purpose irrigation project.

All lands that could be irrigated from the Barge Canal, lakes, or other natural sources were delineated. This was limited by considering only the lands for which the distribution cost would be less than $30 per acre.

Projections for irrigation range from 28,000 acres to over 100,000 acres by the year 2020. To supply water to irrigate this area, 64 upstream reservoir sites were found to have potential for development. There are also 238,000 acres that can be irrigated from existing surface water and 11,000 acres that could be irrigated from ground water.

To supply the needed irrigation water, eight projects are recommended for early action. They include 12 reservoirs and 2 pumping systems to supply irrigation water to 30,540 acres. Total cost of these structural measures is $10,181,200.

IRRIGATION WATER REQUIREMENTS FOR SELECTED LOCATIONS IN THE OSWEGO RIVER BASIN

In planning for the irrigation water needs of the Oswego River Basin, estimates of the amounts of water that may be required are necessary. The objective of this study is to provide some estimates of on-farm irrigation requirements for several locations in the Basin and several crop groups.

Irrigation water requirements were estimated at six locations: Shortsville, Penn Yan, Geneva, Auburn, Baldwinsville, and Rome. These locations provide a good representation of the Basin's varied rainfall, temperature, and soil conditions.

Table C.1 shows the mean monthly temperatures and Table C.2 shows the mean monthly and annual precipitation for these locations.

TABLE C.1 - MEAN MONTHLY TEMPERATURES FOR SELECTED LOCATIONS IN THE OSWEGO RIVER BASIN OF NEW YORK

Location	Mean Monthly Temperatures: May	June	July	August	September
	- - - - - - - - - - - - degrees - - - - - -				
Auburn	56.4	66.0	71.2	69.4	62.3
Baldwinsville	56.3	65.7	70.3	67.6	61.5
Geneva	57.0	67.4	72.4	69.3	62.7
Penn Yan	57.1	66.1	71.4	68.6	62.5
Rome	56.2	64.8	69.7	67.5	59.9
Shortsville	55.4	64.7	69.7	67.5	62.1

Source: Mordoff, R.A. *The Climate of New York State*
Cornell Extension Bulletin 764, New York State College of Agriculture, Cornell University, Ithaca, N.Y.

TABLE C.2 - MEAN MONTHLY AND ANNUAL PRECIPITATION FOR SELECTED LOCATIONS

Location	Mean Monthly Precipitation: May	June	July	August	September	Mean Annual Precipitation
	- - - - - - - - - -inches - - - - - -					
Auburn	3.34	3.65	3.59	3.17	3.09	35.66
Baldwinsville	3.31	3.65	3.83	3.22	3.18	38.96
Geneva	3.24	3.63	3.07	3.10	2.66	33.42
Penn Yan	2.93	3.34	3.37	2.83	2.48	29.50
Rome	4.02	4.68	4.58	4.43	3.94	47.45
Shortsville	2.73	3.76	3.61	2.78	2.65	30.14

Source: Mordoff, R.A. *The Climate of New York State*
Cornell Extension Bulletin 764, New York State College of Agriculture, Cornell University, Ithaca, N.Y.

Consideration was given to the predominant soils and typical crops grown in each location. The *Conservation Irrigation Guide for New York* was the basis for determining crop groups, depth of irrigation, and available moisture capacity for various depths for each soil group.

Available moisture capacity is listed in Table C.3 for the predominant soil groups at these representative locations.

TABLE C.3 IRRIGATION SOIL GROUPS AND TOTAL AVAILABLE SOIL MOISTURE CAPACITY FOR SELECTED LOCATIONS IN THE OSWEGO RIVER BASIN OF NEW YORK STATE

Location	Irrigation Soil Group	Available Moisture Capacity: Depth of Soil (inches)	Capacity for Depth (inches)
Auburn	L-Muck soils 12" or more in depth	12	3.00
		18	4.50
		24	6.00
Baldwinsville	A-Deep, light to moderately light textured soils, uniform, rapid permeability	18	1.35
		24	1.80
Geneva and Penn Yan	D-Deep, medium textured soils 12" deep over medium to moderately heavy textured subsoils, moderate to moderately slow permeability	18	3.50
		24	4.60
Rome and Shortsville	C-Deep, medium, textured gravelly soils 12-15" deep over medium to moderately heavy subsoil, moderate to rapid permeability	18	2.60
		24	3.60

Crops were placed in crop groups on the basis of the depth of soil profile in which the majority of the plant roots are contained and from which the plant obtains 70 to 80 percent of its moisture. Crop group 1 contains the shallow rooted crops (12" root zone). Included in this group are peas, lettuce, onions, spinach, strawberries, and celery. Crop group 2 contains the medium rooted crops (18" root zone). Included in this group are potatoes, beets, and carrots. Deep rooted crops (24" root zone) such as broccoli, cabbage, melons, cucumbers, tomatoes, sweetcorn, and peppers are contained in crop group 3.

The modified Blaney-Criddle method of estimating irrigation water requirements was used. Blaney-Criddle measures plant consumptive use, including the effects of temperature, length of day and available moisture. It includes adjustments for effective rainfall (total rainfall less surface runoff and percolation below the root zone) and the growth stage of the crop. Coefficients reflecting the growth stage of the crop have been developed and plotted as curves.

Coefficient curves were developed originally in the west and reflect the crops for which growth stage the coefficient curves have been developed. This limits the usefulness of the method for making estimates by specific crops as most of the crops irrigated in the Basin are small vegetables and these are all included under one curve. Therefore, in this analysis, it was only possible to make estimates for potatoes, shallow rooted small vegetables, medium rooted small vegetables, and deep rooted small vegetables.

Table C.4 gives the average gross irrigation water requirements and the requirement for 8 years out of 10.

TABLE C.4 AVERAGE GROSS IRRIGATION WATER REQUIREMENTS AND TWENTY PERCENT CHANCE GROSS IRRIGATION WATER REQUIREMENTS FOR SELECTED LOCATIONS IN THE OSWEGO RIVER BASIN OF NEW YORK

Location	Crop and Soil Depth Irrigated		Gross Irrigation Water Requirements	
			Average	8 Yrs. out of 10
		(inches)	(inches)	(inches)
Auburn	Potatoes	18	16.9	19.5
	Small vegetables	12	7.5	9.1
	Small vegetables	18	5.5	7.3
	Small vegetables	24	4.1	5.9
Baldwinsville	Potatoes	18	22.6	24.1
	Small vegetables	18	9.7	10.9
	Small vegetables	24	8.5	9.9
Geneva	Small vegetables	18	8.4	9.8
	Small vegetables	24	7.0	8.6
Penn Yan	Small vegetables	18	7.6	9.2
	Small vegetables	24	6.3	7.9
Rome	Small vegetables	18	4.6	6.1
	Small vegetables	24	3.2	5.0
Shortsville	Small vegetables	18	7.8	9.3
	Small vegetables	24	6.2	7.8

The 20 percent requirement is the amount that would be sufficient 80 percent of the time (e.g. 8 years out of 10), but would be insufficient to meet requirements 20 percent of the time (e.g. 2 years out of 10). This is generally accepted as a reasonable goal for planning irrigation developments.

Requirements ranged from a high of two acre-feet for potatoes on sandy soils near Baldwinsville to a low of less than 1/2 acre-foot for deep rooted small vegetables on muck soils near Auburn and gravelly loams near Rome. The most common requirements were about 3/4 of an acre-foot.

The variations in requirements between areas, soils, and crops have some implications for planning, particularly for near future needs and potentials. Consideration should be given to the area where early development of irrigation is likely to occur, the soils that will be used and the crops that will be grown. All of these factors may influence the amount of water that may need to be stored.

METHODS AND PROCEDURES

IRRIGABLE LAND DESCRIPTIONS AND PROCEDURES

Not all soils in the Basin are capable of being irrigated economically. To determine irrigation feasibility, it is necessary to consider (correlate) some assumptions concerning crop, economic engineering and soil factors. These include:

1. The method of irrigation is an adequately designed sprinkler system.

2. Topography is restricted to 0-5 percent slopes.

3. Crops to be irrigated are vegetables, berries, and fruit adapted to local climatic and site conditions. These include crop groups 1, 2, 3, 4, and 6 in the Soil Conservation Service, *Conservation Irrigation Guide for New York*. Also included as irrigable crops are grasses on golf courses and turf farms. (On golf courses, all soils will be irrigated because of the shallow depth of irrigation.)

4. The practical maximum limit to irrigate most soils is 24 inches.

5. Landowners are using the best cultural, and conservation and water management practices feasible for their operation. Based on these assumptions, three irrigable soil groups were defined. Soils considered irrigable are those which are capable of accepting (infiltration) and transmitting (permeability) irrigation water. Also, they are capable of giving a satisfactory response when irrigation is applied. Necessary conditions are:

   a. Soils are well drained or capable of being adequately drained for intensive use according to the Soil Conservation Service *New York Drainage Guide*, and a suitable drainage outlet is available or feasible to construct. The following drainage need groups are defined:

      (1) No Drainage Needed - Essentially these soils are well or excessively drained. Diversions or terraces may be needed on gentle slopes (above 2 percent).

      (2) Moderate Drainage Needed - Soils in this group are moderately well drained. The drainage needs are moderate and include random tile, open ditches, drainage land grading, diversions, or terraces. On nearly level land (0-3 percent slopes) where intensive cropping systems, and/or early or late season equipment operation is necessary, systematic tile may be needed.

      (3) Intense Drainage Needed - These soils are somewhat poorly drained or wetter. They need systematic tile, open ditches, drainage land grading, pump plants, diversions, or terraces.

   b. Permeability of the most limiting soil horizon to a depth of 24 inches is at least moderately slow (0.2" per hour). For this study, the soils in the following two groups are combined:

      (1) Rapid - Include permeability classes moderately rapid, rapid, and very rapid (2.0"-6.3"/hr.).

      (2) Moderate - Include permeability classes moderately slow and moderate (0.2"-2.0"/hr.).

c. Soils considered not irrigable are:

(1) Soils to stony, rocky, cobbly, or flaggy that crops suitable to be irrigated could not be grown.

(2) Soils that are clayey (fine textured), shallow, or have fragipans which restrict permeability in the 24" zone.

Using these assumptions and definitions, the following brief descriptions of each irrigable soil group were developed:

TYPE II - Irrigable Land Groups

Group 1 — Rapid to Moderate Permeability - No Drainage Needed

Soils in these areas are dominantly well to excessively drained, developed from coarse and medium textured soil materials. They occur as stream bottomland, terraces, old lake beaches, and gently rolling lake plain and upland landforms. The moisture-holding capacity ranges from low to high. Flooding is a hazard on alluvial soils of the flood plain.

Group 2 — Rapid to Moderate Permeability - Moderate Drainage Needed

This group is dominantly moderately well drained soils developed from coarse and medium textured soil materials. Nearly level to gently sloping landforms on the lake plain, upland moraines, outwash and flood plain terraces. Their ability to hold moisture is high to low. Flooding is a hazard on the alluvial soils of the flood plain.

Group 3 — Rapid to Moderate Permeability - Intense Drainage Needed

Soils in this group range from somewhat poorly to very poorly drained. They are developed from coarse to medium textured soil material and also include soils developed from organic materials. Nearly level topography is most common, but some areas are gently sloping. The capacity to hold moisture is high to low. Water management practices to control the water table on some of these soils will be beneficial. Flooding is a hazard on alluvial soils of the flood plain.

Irrigable lands in urban areas were not designated. However, at the request of the Water Resources Division, New York State Department of Environmental Conservation, forest lands suitable for irrigation were delineated. Priorities for future conversion of forest land into agricultural production would logically be group 1, group 2, and then group 3. Exceptions in this priority would be areas of deep muck, and sandy soils in group 3 which occur in favorable local climatic conditions; they would be with group 1 in the highest priority.

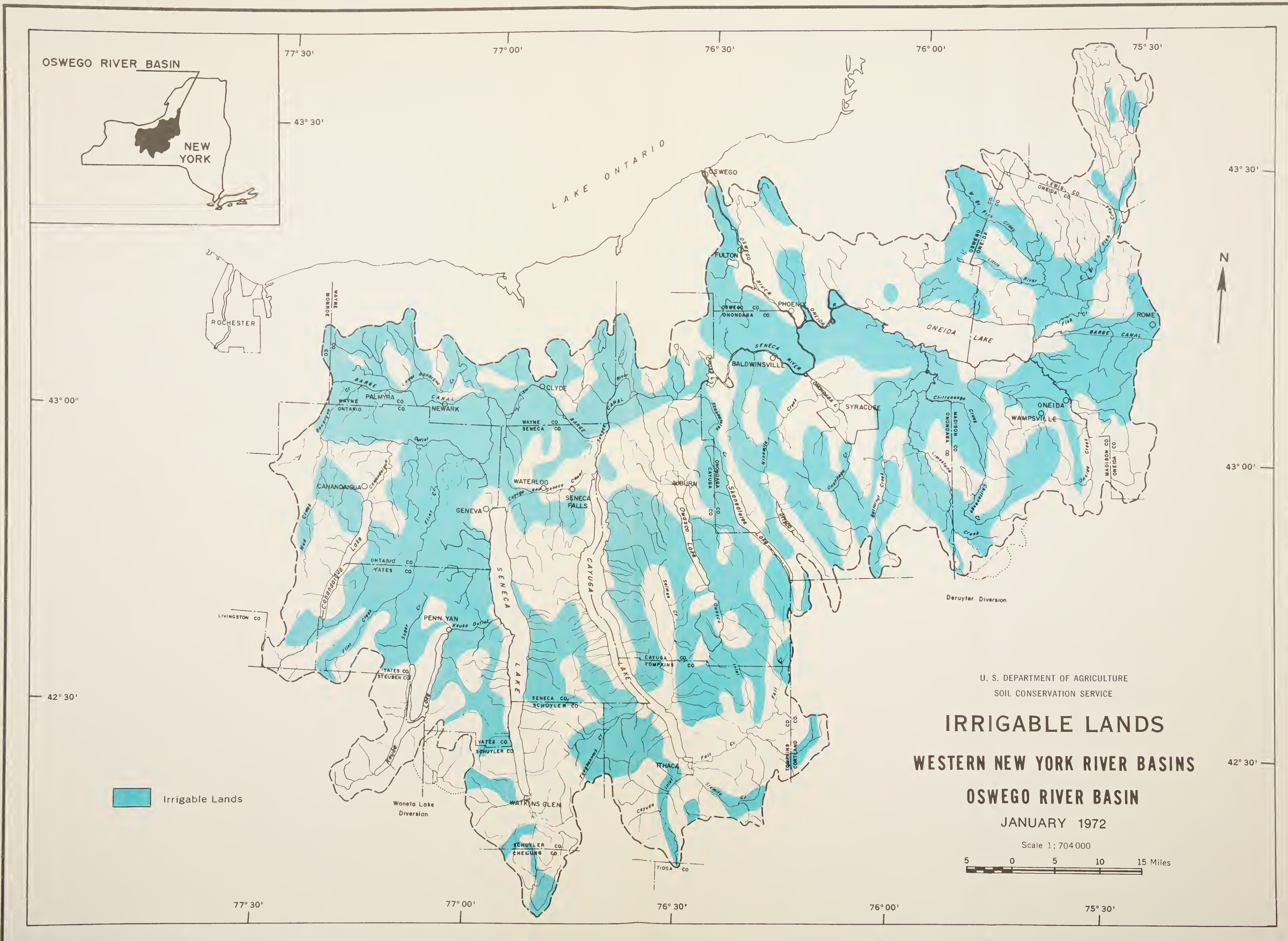
Current soil survey field sheets for the soil and water conservation districts in the Basin were used as base maps to delineate irrigable lands. Published soil survey reports were used in Cortland, Lewis, Schuyler, Tompkins, Ontario and Yates counties.

Subwatersheds were outlined on the base maps. The acreage in each group was measured and tabulated. Table C.6 shows the acreage of irrigable soil groups by counties. Table C.5 indicates the acreage of each soil group by watershed.

From the individual soil survey field sheets, a map showing the general areas of irrigable land was made for each county. In turn, this was transferred to a Basin map. Figure C.1 shows the general areas of irrigable land in the Oswego River Basin.

TABLE C.5 - IRRIGABLE SOIL GROUPS BY WATERSHEDS IN THE OSWEGO RIVER BASIN, NEW YORK

Watersheds	No Drainage Needed	Moderate Drainage Needed	Intense Drainage Needed	Total
		(Acres)		
5	8,090	6,240	8,170	22,500
11	12,220	14,170	11,400	37,790
12	270	180	40	490
29	2,000	1,340	1,830	5,170
30	2,290	1,360	1,610	5,260
52	6,280	4,600	530	11,410
68	2,170	7,750	2,730	12,650
71	18,160	11,430	6,280	35,870
88	570	6,200	3,930	10,700
90	14,320	6,730	2,480	23,530
122	15,110	6,590	4,200	25,900
127	7,170	2,760	12,620	22,550
137	150	1,730	-	1,880
140	2,400	3,350	1,720	7,470
142	4,970	2,640	7,610	15,220
150	2,310	2,030	1,460	5,800
419	11,040	3,460	4,280	18,780
420	730	3,620	13,040	17,390
421	9,700	2,410	12,780	24,890
422	940	8,080	8,640	17,660
423	13,940	1,860	10,300	26,100
424	2,670	150	4,170	6,990
425	3,350	1,350	2,100	6,800
426	7,210	6,560	12,880	26,650
433	11,240	18,080	15,550	44,870
434	14,770	6,970	4,330	26,070
435	18,610	12,820	11,290	42,720
436	7,100	2,430	2,810	12,340
437	21,560	11,390	11,390	44,340
438	10,130	12,970	4,560	27,660
439	3,950	4,300	1,950	10,200
440	14,070	18,130	5,220	37,420
441	6,770	6,150	3,020	15,940
442	1,640	5,620	680	7,940
443	5,130	4,800	1,160	11,090
444	16,490	28,890	7,730	53,110
445	6,180	5,370	2,970	14,520
446	10,070	3,830	4,280	18,180
447	3,860	8,670	3,330	15,860
448	1,380	2,810	710	4,900
449	26,060	38,100	10,390	74,550
450	4,920	9,800	4,690	19,410
451	11,320	13,900	5,120	30,340
452	5,420	2,450	520	8,390
453	5,600	3,450	1,870	10,920
454	8,640	4,510	14,440	27,590
455	11,160	5,000	5,010	21,170
456	7,800	2,670	2,250	12,720
457	9,600	5,140	1,350	16,090
458	10,390	10,770	3,630	24,790
459	6,840	4,370	640	11,850
460	10,560	8.840	2,620	22,020
461	7,400	3,730	1,280	12,410
462	12,500	9,460	3,680	25,640
463	4,160	3,290	2,160	9,610
TOTALS	443,380	385,300	275,430	1,104,110



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE C.1

TABLE C.6 - IRRIGABLE SOIL GROUPS BY COUNTIES IN THE OSWEGO RIVER BASIN, NEW YORK

County	No Drainage Needed	Moderate Drainage Needed	Intense Drainage Needed	Total
	Acres			
Cayuga	90,360	71,050	27,770	189,180
Chemung	2,430	900	980	4,310
Cortland	3,950	2,100	500	6,550
Lewis	1,000	60	4,070	5,130
Madison	30,610	17,800	22,530	70,940
Monroe	600	810	990	2,400
Oneida	29,050	12,420	40,960	82,430
Onondaga	71,290	63,640	31,850	166,780
Ontario	60,410	56,570	33,960	150,940
Oswego	32,800	17,980	39,170	89,950
Schuyler	5,750	14,220	290	20,260
Seneca	27,830	31,640	13,760	73,230
Steuben	1,740	3,020	800	5,560
Tompkins	14,270	32,530	18,410	65,210
Wayne	36,400	23,260	22,850	82,510
Yates	34,890	37,300	16,540	88,730
TOTAL	443,380	385,300	275,430	1,104,110

IMPOUNDMENT SITES

A feasibility study was made of all possible irrigation impoundments. The irrigation storage was fixed by a generalized relationship of the ultimate storage potential and the total demand of the area within reasonable distance of the site.

Factors affecting the selected irrigation storage were: (1) topographic features and limits, (2) irrigation demand (normally up to 5 miles downstream from the site), and (3) water yield from the drainage area.

Distribution Systems

The irrigation distribution system considered involves the transfer of irrigation water from a point of supply to a point of distribution. It is assumed that all large irrigable areas over one-half mile from a point of supply will require this distribution system. Wherever possible, natural water courses are used to convey the water. However, often the method of delivery is a pumping station and an underground pipeline. The pumping station would be located at the water source with a stream block providing a sump pool for the pump. The landowners would connect directly onto the main pipeline with their lateral pipelines and booster pumps or they might pump from a small storage pond which would be constructed at the end of the main underground pipeline. Total pumping requirements are based on a peak capacity of 10 gallons per minute per acre irrigated.

Feasibility studies were made of irrigation canals where it was found that irrigation water could be diverted from a stream and transported to irrigable areas. The capacity of the canal was based on a flow rate of 1 cfs for each 50 acres irrigated.

Another study was made to determine all the land that could be supplied water from the Barge Canal, lakes, and streams with a distribution cost of less than $30 per acre. In this study, it was assumed that a pumping system would be used. The minimum area considered was 100 acres. It was assumed that the lands within one-half mile from the canal would be developed by individual farmers and would not be included in a project. The distribution system would be similar to what is described in the first paragraph.

NATURE AND ESTIMATE OF COST OF IMPROVEMENTS

USGS 7-1/2 minute topographic maps were used for stage-storage and fill volume computations. Construction cost estimates were developed on the basis of compacted fill using a unit price per cubic yard. This unit price represents all normal construction items. The unit price is based on a comparative study of actual contract cost of PL-566 structures in New York.

Cost of treating unfavorable geologic conditions and clearing were estimated. Cost of land rights and relocations were based on values obtained from local representatives of utilities and highway departments and the present sale value of land and buildings.

Annual operation and maintenance of the works of improvements is expected to be 0.5 percent of the construction cost of the site.

PRESENT AND FUTURE IRRIGATION

Present Conditions

At the present time, slightly less than 10,000 acres are being irrigated in the Basin. This is far less than the potential one million acres which would respond to irrigation.

There are several reasons why so few acres are being irrigated. Although precipitation has been irregular in recent years, there have been very few years of serious drought and these have not been consecutive. Many farmers do not believe the benefits derived from irrigation are substantial enough to offset the high cost of purchasing irrigation equipment. In conjunction with these two reasons, many farmers do not have an adequate source of water readily available at the time they need to irrigate.

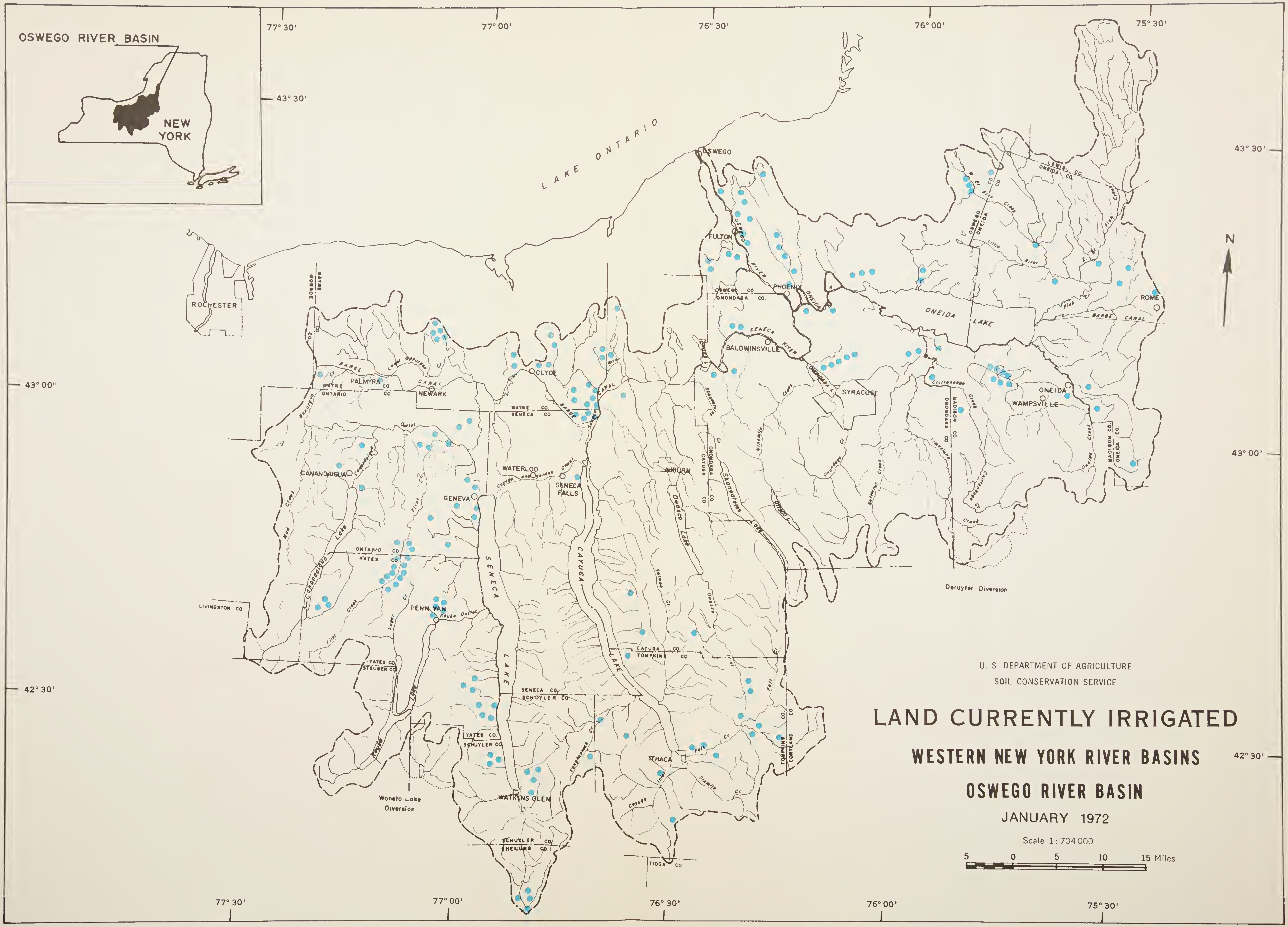
Table C.5 shows the acreages by county that are presently being irrigated. Figure C.1 shows these locations on a map. Water for this irrigation comes from existing streams, the Barge Canal, and in a few cases from farm ponds.

FUTURE PROJECTIONS

In planning for the irrigation water needs of the Oswego River Basin, estimates of the acres to be irrigated are necessary. The objective of this study is to provide such estimates in light of historical practices and continuation of the provision of regional share of food and fiber.

Projections of Irrigated Acreage from Historical Data

Data for irrigated cropland was obtained from the Census of Agriculture for 1954, 1959 and 1964. This is the only historical data available on irrigated acreage for the counties in the Oswego



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

LAND CURRENTLY IRRIGATED

WESTERN NEW YORK RIVER BASINS

OSWEGO RIVER BASIN

JANUARY 1972

Scale 1: 704 000

USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE C.2

TABLE C.7 - AG AND NON AG LAND CURRENTLY IRRIGATED BY COUNTIES IN THE OSWEGO RIVER BASIN, NEW YORK

County	Agricultural	Non-Agricultural	Total
	-Acres-		
Cayuga	400	40	440
Chemung	-	130	130
Cortland	-	-	-
Lewis	-	-	-
Madison	300	20	320
Monroe	-	-	-
Oneida	240	630	870
Onondaga	1,190	800	1,990
Ontario	590	180	770
Oswego	1,150	170	1,320
Schuyler	60	10	70
Seneca	400	10	410
Steuben	-	-	-
Tompkins	150	880	1,030
Wayne	1,370	500	1,870
Yates	360	-	360
TOTAL	6,210	3,370	9,580

TABLE C.8 - ESTIMATED ACREAGE OF IRRIGATED LAND IN THE OSWEGO RIVER BASIN, NEW YORK 1954, 1959, and 1964

County	1954 1/	1959 2/	1964 2/
	-Acres-		
Cayuga	105	152	337
Chemung	13	-	-
Cortland	6	13	63
Lewis	-	-	-
Madison	42	103	245
Oneida	175	344	64
Onondaga	318	523	1,190
Ontario	245	387	618
Oswego	225	587	958
Schuyler	12	8	58
Seneca	40	25	312
Steuben	18	15	2
Tompkins	81	212	125
Wayne	412	772	1,303
Yates	55	72	110
BASIN TOTAL	1,747	3,213	5,385

Source: *Census of Agriculture*

1/ Estimated from county data based on percent of county in Basin.
2/ Estimated from town data based on percent of town in Basin

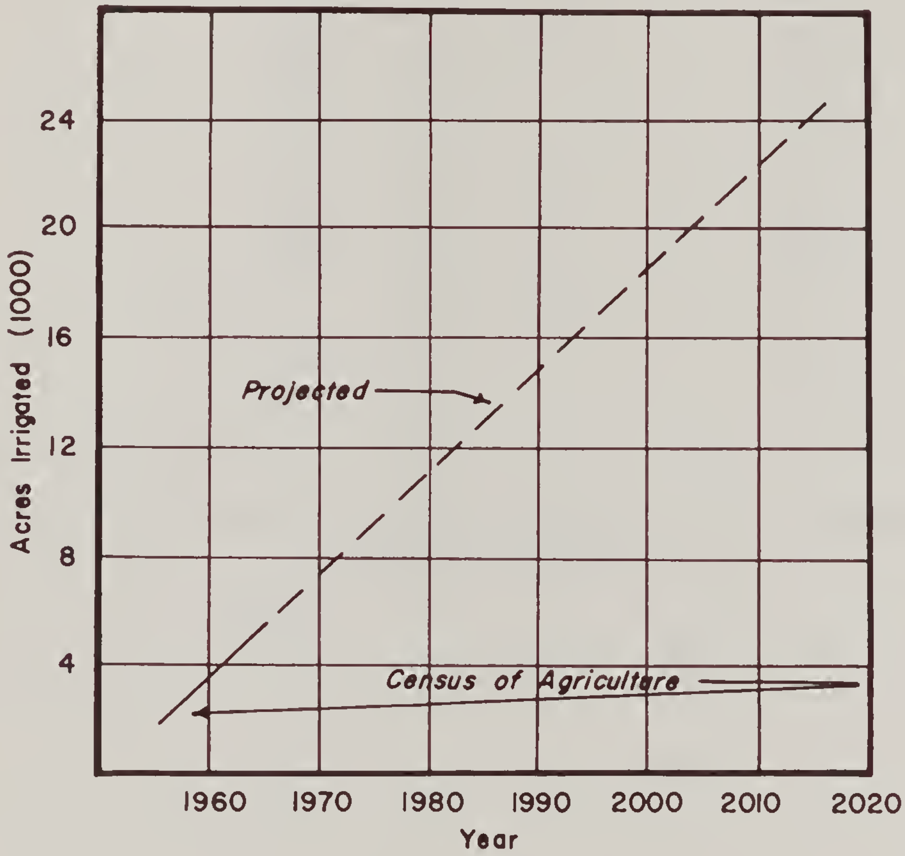
Change 1954-59	1,466 acres	84 percent increase
Change 1959-64	2,172 acres	68 percent increase

Mean of 3 years: 3,448 acres

Basin. This is available on a county basis for 1954 and on a town basis for 1959 and 1964. This data is presented in Table C.8.

With data for only three points in time, it makes little sense to use any projection technique except a linear trend drawn through the mean of the three years and with a slope approximating a least squares mile. This line was then extended linearly to 2020 (Figure C.3).

FIGURE C.3 - ESTIMATED ACREAGE OF IRRIGATED LAND IN THE OSWEGO RIVER BASIN OF NEW YORK 1954, 1959, AND 1964 AND PROJECTED TO 2020



There are numerous problems with such a projection. The underlying forces behind increasing adoption of irrigation are largely ignored. Ideally, such a projection would be improved if the effect of these forces, both positive and negative, could be identified and included in the method of projection. One of the obvious forces is weather. Table C.9 illustrates how rainfall has varied both within the Basin during a given period of time and between time periods. Assuming that adoption tends to accelerate in dry years and slack off in normal or wet years, one could conclude that acreage irrigated in 1964 may be above the long run trend. However, many other factors such as inter-regional competition and changing technology also influence the trend as well as weather. Such forces have been very important in the recent past and can be expected to continue to play a major role in shaping future agriculture.

Disaggregation of Nation Projections of Food and Fiber Needs 1/

National projections were developed by Economic Research Service based on historical and projected changes in the nation's need for food and fiber. Projections for the Middle Atlantic region were derived from these using shift-share analysis. The Oswego River Basin projections were determined in much the same manner, but with reference to the Middle Atlantic region rather than the nation.

1/ For a more complete treatment see Hunt, Charles S., Olson, Gerald W., and Hardy, Ernest E., *The Oswego River Basin: Projections of Agricultural Production,* Jan. 1969, A. E. Res. 276, Dept. of Agr. Econ., Cornell University, Ithaca, New York

TABLE C.9 - MEAN FIVE MONTH 1/ PRECIPITATION AND FIVE MONTH PRECIPITATION FOR 1954, 1959, AND 1964 FOR SELECTED WEATHER STATIONS IN THE OSWEGO RIVER BASIN, NEW YORK

Station	County	5 Month 2/ Mean PPT	5 Month 3/ 1954 PPT	Difference	5 Month 3/ 1959 PPT	Difference	5 Month 3/ 1964 PPT	Difference
		- - - - - - - -	- - - - - - - -	- - - - - - - - Inches	- - - - - - - -	- - - - - - - -	- - - - - - - -	- - - - - - - -
Auburn	Cayuga	13.50	13.09	- .41	10.37	- 3.13	6.30	- 7.20
Fulton	Oswego	15.34	16.04	+ .70	15.72	+ .38	11.00	- 4.34
Geneva	Ontario	14.51	11.43	- 3.08	15.51	+ 1.00	13.79	- .72
Newark	Wayne	14.26	13.68	- .58	17.45	+ 3.19	9.75	- 4.51
Syracuse	Onondaga	14.97	18.20	+ 3.23	12.45	- 2.52	9.71	- 5.26

1/ May, June, July, August, and September

2/ Dethier, B. E., *Precipitation in New York State, Bulletin 1009*, New York State College of Agriculture, Cornell University, Ithaca, New York, July 1966

3/ *Climatological Data for New York*, U. S. Weather Bureau, U. S. Department of Commerce

TABLE C.10 - ACRES NEEDED TO MEET PROJECTED OUTPUT IN THE OSWEGO RIVER BASIN OF NEW YORK STATE

Crops	1970	1980	1990	2000	2010	2020
Corn grain	87,900	85,400	87,500	89,300	113,600	116,800
Corn silage	76,500	91,600	110,900	126,800	147,300	172,000
Oats	123,000	95,200	83,900	73,000	62,100	48,700
Wheat	84,800	75,100	98,500	108,600	120,300	118,200
Hay	315,300	287,300	271,200	256,200	245,600	226,500
Vegetables	35,100	39,200	43,500	67,900	77,100	86,700
Fruit	22,700	22,700	22,500	22,200	21,800	21,400
Potatoes	5,300	4,800	4,500	4,500	4,600	4.200
Dry beans	44,100	46,700	48,000	50,100	53,200	55,700
Miscellaneous*	7,900	7,400	7,700	8,000	8,500	8,500
Total Cropland	802,600	755,400	778,200	806,600	854,100	858,700
Total Pasture	456,400	419,900	361,000	320,000	239,000	169,000

*1 percent of total cropland

TABLE C.11 - ACRES OF CROPLAND HARVESTED PROJECTED TO BE AVAILABLE BY DECADE TO 2020 IN THE OSWEGO RIVER BASIN, NEW YORK

1970	1980	1990	2000	2010	2020
-Thousands of Acres-					
735	668	632	597	561	525

TABLE C.12 - PROJECTION CROPLAND REQUIRED FOR AGRICULTURAL PRODUCTION UNDER VARIOUS ASSUMPTIONS OF CROP MIX, OSWEGO RIVER BASIN OF NEW YORK STATE

	1970	1980	1990	2000	2010	2020
-Thousands of Acres-						
All Feed Units from Hay 1/	607	587	592	602	628	652
All Feed Units from Corn Silage 2/	273	264	266	271	282	293
Projected Mix of Hay & Corn Silage 3/	392	379	382	383	393	399
Cash Crops 4/	177	173	202	239	264	273
Corn Silage & Cash Crops 5/	450	437	468	510	546	566
Projection of Cropland Available	735	668	632	597	561	525

1/ Acres needed if all roughage feed units come from hay.
2/ Acres needed if all roughage feed units come from corn silage.
3/ Acres needed if roughage feed units come from projected mix of corn silage and hay.
4/ Acres of cash crops include wheat, vegetables, potatoes, dry beans, and miscellaneous crops does not include corn grain, oats, or fruit.
5/ Sum of second and fourth rows.

Through the use of assumed yields and feed conversion rates, these production projections were translated into cropland needs (Table C.10). Based on the assumptions used, the greatest increases would likely be in corn grain, corn silage (reflecting increased requirements for milk), wheat, and vegetables.

Estimates of the future availability of cropland were based on historical trends as reported in the *Census of Agriculture* with some adjustments based on the *Conservation Needs Inventory of 1958*, and other materials. These projections are presented in Table C.11.

A comparison of Table C.10 (projected needs) and Table C.11 (projected availability) indicates that projected needs will fall short of projected availability by 1970 and the gap will widen in successive decades until 2020 when needs are projected to exceed availability by one-third million acres.

By the short-range planning goal of 1980, projected needs will exceed availability by over 87,000 acres.

It must be kept in mind that the projections are quite sensitive to the underlying assumptions. For instance, if the assumption concerning the ratio of corn silage and hay fed to dairy cows is changed and it is assumed that in the near future, feeding of a high ratio of corn silage will be a universal practice, considerably less land will be needed to meet food needs. (Table C.12).

A comparison of the two bottom lines on Table C.12 gives an indication of the needs-availability situation if one assumed dairy cows were fed all corn silage and concentrates imported from outside the Basin.

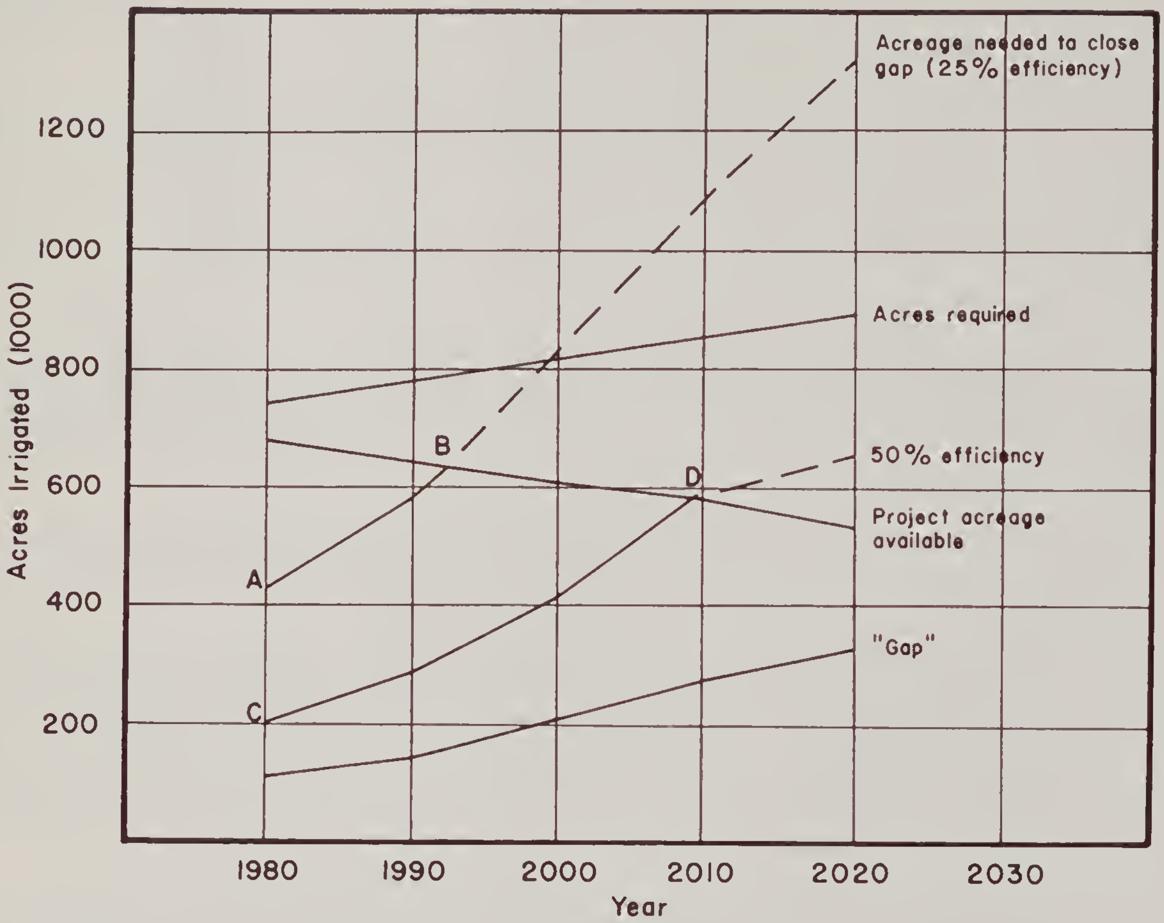
The important point to recognize is that the projections represent what has sometimes been referred to as the "requirement game". It is a demand study only in a very broad sense, with the terms "demand","need","requirement", and even "use" and "consumption" used almost interchangeably. The projections provide a basis for anticipating pressures on resource use in the distant future. They may provide a basis for the expectation that some set of public resource development projects should be studied further. They have little to do with their actual justification.

With this in mind, it appears that in the Oswego Basin we can anticipate some pressure on the land resource if the Basin is to continue to provide its historical share of national food and fiber production. This implies that irrigation, drainage and flood protection measures may be necessary if the Basin is to meet the implied objective of maintaining its historical share. Whether these measures would be economically feasible, however, may be a deciding factor relating to future resource development.

Alternative Irrigation Development Schemes

Considering only irrigation, with all other technological development held constant, the efficiencies in land use which can be gained through its application can reduce some of the pressure on the land resource base. For example, assuming a 25 percent increase in production through irrigation, the production gap projected for 1970 could be eliminated by irrigating 260,400 acres (Point A, Figure C.4). By increasing irrigation to meet all expanding needs thereafter, all acres projected to be available for cropland would be irrigated shortly after 1990 (Point B, Figure C.4). Beyond this point, more acres would have to be irrigated than are projected to be available in order for the Basin to provide its historical share of national food and fiber production. Similarly, if a 50 percent increase in production through irrigation is assumed, the production gap projected for 1970 could be eliminated by irrigating 135,200 acres (Point C, Figure C.4) and just before 2000, all projected acres harvested would be under irrigation (Point D, Figure C.4). These alternatives are also given in Table C.13.

FIGURE C.4 - ALTERNATIVE IRRIGATION DEVELOPMENT SCHEME, 1980-2020, OSWEGO RIVER BASIN, NEW YORK



The above examples are not intended to represent a normative position of what should be done, but rather to emphasize the magnitude of the problem of closing the gap between projected acres required to provide the Basin's historical share of national food and fiber production and the projected availability of cropland harvested. Similar examples could be given for drainage and flood protection as they also have possibilities of increasing production from a given resource base. Expected returns from these alternative investments are needed to assess the possible contribution of such investments and to compare with irrigation.

If nonagricultural pressure on the land resource continues unabated, it is impractical to assume that anything like 260,000 acres will be irrigated in 1970 or even 430,000 by 1980. Also, it is unlikely that drainage or flood control can contribute substantially to closing this ever-widening gap without concerted effort on the part of the agricultural industry. It is therefore quite likely that if the projections are close to representing future trends, the Basin will not be able to continue to provide its historical share of national food and fiber production.

This short study implies that to maintain or increase income to the region from the agricultural industry, investment in irrigation, drainage and flood protection should be given adequate attention and study along with technological developments and management techniques. The alternative strategy is to look to the other sectors of the economy to make additional contributions to compensate for the relative declining role of agriculture.

STATE IRRIGATION GOALS

Studies made by the New York State Department of Environmental Conservation indicate goals of 40,000 irrigated acres by 1985 and 100,000 irrigated acres by 2020 are not unreasonable. To reach these goals some type of irrigation projects will be required. Also, laws regarding the use of water from the Barge Canal will need revision.

TABLE C.13 - ALTERNATIVE CROPLAND IRRIGATION DEVELOPMENT SCHEMES, 1970-2020 OSWEGO RIVER BASIN NEW YORK

Year	Projected Acreage Required	Projected Acreage Available	"Gap"	Irrigation with 25% Efficiency 1/	Irrigation with 50% Efficiency 1/
	- - - - - - - -	- - - - - - - -	Thousands of Acres-	- - - - - - - -	- - - - - - - -
1970	802.6	735.0	67.6	260.4	135.2
1980	755.4	668.0	87.4	429.6	214.8
1990	778.2	632.0	146.2	584.8	292.4
2000	806.6	579.0	209.6	838.4 2/	419.2
2010	854.1	561.0	293.1	1,172.4 2/	586.2 2/
2020	858.7	525.0	333.7	1,334.8 2/	667.4 2/

1/ Number of acres that would need to be irrigated to eliminate the gap between projected acreage required and projected acreage available.
2/ These amounts exceed the amount of land projected to be available at these times.

POTENTIAL FOR MEETING NEEDS

As shown in Table C.14, there is a total of 262,900 acres of irrigable lands that can be supplied with irrigation water for less than $30 per acre annual cost. Any cost for the use of the water has not been included. The totals as shown in Table C.14 for existing surface water, ground water, reservoirs, and within 1/2 mile of canal add to more than the total net land. The reason for this is some lands can be irrigated from several different alternate sources of water. It is anticipated that project action would be required to develop any of these water sources except within 1/2 mile of canal. The lands along the canal can be developed by individual farmers. When the capacity of the Barge Canal to supply irrigation water is exceeded, it can be augmented from reservoir sites.

Figures C.5 and C.6 show the location of the lands that can be irrigated from existing surface water and ground water sources. Table C.15 gives data and cost for upstream reservoir sites found feasible for irrigation use.

Sites with a benefit cost ratio of 0.8:1 or better were included. Other benefits probably can be found for the site therefore giving the total project a favorable B:C ratio.

Table C.16 gives some data and cost for some typical diversion projects using water from the Barge Canal.

CNI-437 - CANANDAIGUA OUTLET

Sites 437-2, 437-6, and 437-8 as described in the *Preliminary Upstream Reservoir Studies*, Oswego River Basin, can supply the needed water. Altogether they supply 3,720 acre feet of water for irrigation. Site 437-2 can also supply 1,080 acre-feet annually for augmentation to the Canandaigua Outlet.

CNI-439 - ROCKY RUN

Sites 439-1, 439-3, and 439-7 as described in the *Preliminary Upstream Reservoir Studies*, Oswego River Basin can supply a total of 3,190 acre-feet of water for irrigation. Site 439-3 can also supply 890 acre-feet annually for augmentation to the Canandaigua Lake Outlet.

CNI-441 - KASHONG CREEK AND CNI-444 - WILSON CREEK (PART OF SENECA LAKE WATERSHED)

Sites 441-3 and 444-8 as described in the *Preliminary Upstream Reservoir Studies*, Oswego River Basin can supply the needed water. Together they can supply 2,340 acre-feet of irrigation water. A recreation lake at 540 acres can be included in site 441-3.

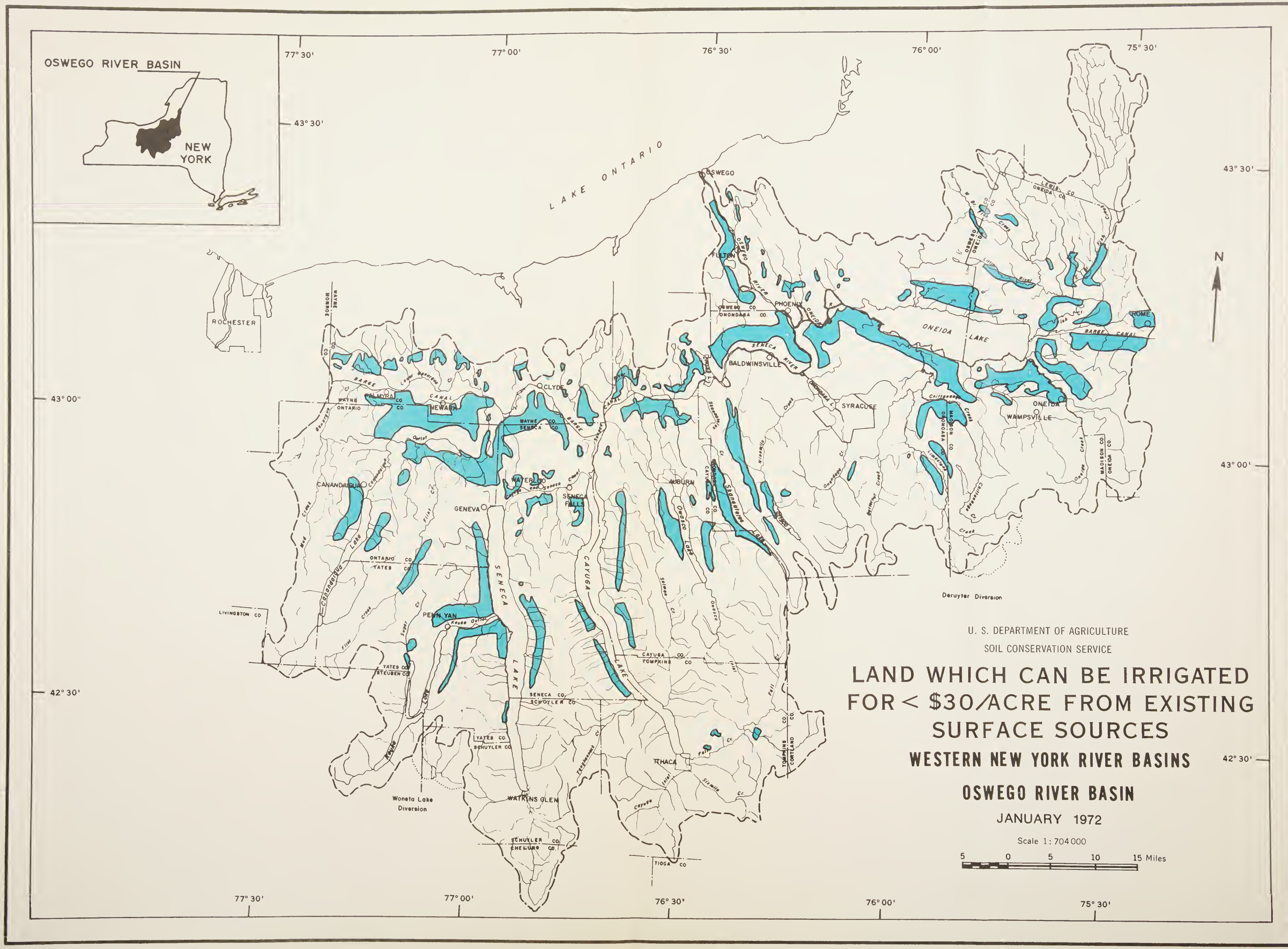
CNI-446 - CLYDE RIVER

Sites 446-1 and 446-6 as described in the *Preliminary Upstream Reservoir Studies*, Oswego River Basin can supply 1,300 acre-feet of irrigation water. They also can supply 2,670 acre-feet of water for augmentation to the Barge Canal.

TABLE C.14 - IRRIGABLE LANDS IN THE OSWEGO RIVER BASIN, NEW YORK SUMMARIZED BY COUNTIES

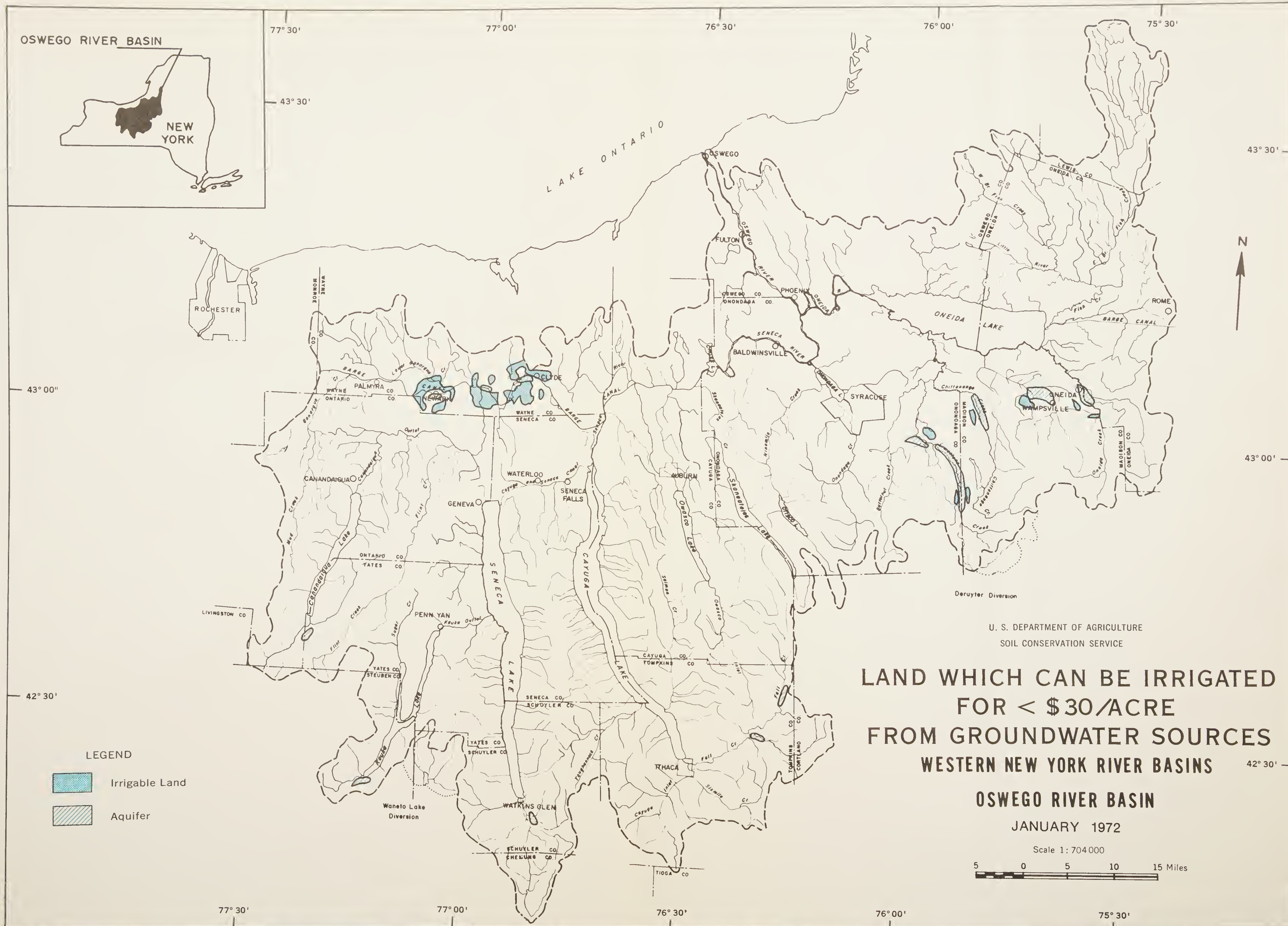
County	Lands that can be supplied with irrigation water for less than $30 by source 1/				
	Existing Surface Water (ac.)	Ground Water (ac.)	Reservoirs (ac.)	Within 1/2 Mile of Canal (ac.)	Net Land 2/ (ac.)
Cayuga	31,300	0	5,500	1,300	36,500
Chemung	0	0	0	0	0
Cortland	0	0	0	0	0
Lewis	0	0	0	0	0
Madison	14,900	2,000	900	0	15,800
Monroe	0	0	0	0	0
Oneida	24,900	0	1,100	1,900	26,800
Onondaga	48,500	1,200	3,000	2,600	53,700
Ontario	29,700 3/	100	10,200	200	33,800 3/
Oswego	18,600	0	2,900	1,200	21,000
Schuyler	0	0	900	0	900
Seneca	19,100	0	1,000	1,500	20,600
Steuben	400	400	400	0	400
Tompkins	1,000	300	2,700	0	3,200
Wayne	24,500 3/	7,000	7,300	3,400	30,100 3/
Yates	12,900	0	2,600	0	15,000
TOTALS	225,800	11,000	38,500	12,100	262,900

1/ Rounded to closest 100 acres.
2/ Net land reduces the total irrigable land by allowing percentage for gross areas as well as for areas that can be served by alternate sources.
3/ Includes land available from Canandaigua Lake Outlet.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE C.5



USDA-SCS HYATTSVILLE, MD. 1973

FIGURE C.6

TABLE C.15 - DATA AND COSTS FOR FEASIBLE IRRIGATION WATER STORAGE SITES, OSWEGO RIVER BASIN NEW YORK

Site No.	Drainage Area (Sq.Mi.)	Acre Feet Supplied	Total Beneficial Storage	Install. Cost ($1,000)	Average Annual Cost	Average Annual Benefits	Benefit: Cost Ratio	Remarks
29-1	1.2	630	630	310	15,220	19,060	1.2:1	
29-2	0.6	300	300	120	5,890	9,080	1.5:1	
29-3	1.2	360	560	156	7,660	10,890	1.2:1	
30-1	0.4	200	200	118	5,790	6,050	1.1:1	
68-4	10.0	630	5,300	440	21,600	19,060	0.9:1	
68-5	5.0	630	1,750	475	23,320	19,060	0.8:1	
71-8	1.6	620	1,150	160	7,860	18,600	2.4:1	
90-1	5.7	780	3,350	498	25,790	23,600	0.9:1	Pumping Plant 1/
90-5	1.5	300	920	85	4,170	9,080	2.1:1	
122-3	25.0	880	10,000	393	21,180	26,770	1.3:1	Pumping Plant
140-3	1.1	540	580	400	19,640	16,340	0.8:1	
419-1	2.7	620	620	470	24,700	18,760	0.8:1	Pumping Plant
421-1	2.7	520	520	279	13,700	15,580	1.1:1	
423-6	2.2	450	1,160	194	9,520	13,610	1.4:1	
423-9	1.2	330	1,020	202	10,830	9,980	0.9:1	Pumping Plant
426-3	5.1	740	3,600	387	19,000	22,240	1.2:1	
433-1	1.1	600	670	360	20,650	18,150	0.9:1	Pumping Plant
433-5	1.2	680	680	441	24,350	20,420	0.8:1	Pumping Plant
434-16	1.1	330	480	124	6,090	9,980	1.6:1	
435-1	1.3	440	570	245	12,030	13,160	1.1:1	
435-2	0.8	350	350	188	9,230	10,590	1.1:1	
435-3	0.6	270	270	192	10,700	8,170	0.8:1	Pumping Plant
435-4	0.9	400	400	280	13,750	12,100	0.9:1	
435-5	0.3	130	130	61	3,000	3,930	1.3:1	
436-3	2.0	340	640	254	12,470	10,440	0.8:1	
436-5	4.1	460	1,800	330	16,100	14,070	0.9:1	
437-2	10.2	1,350	2,440	930	45,660	40,840	0.9:1	
437-5	1.6	680	680	325	15,960	20,570	1.3:1	
437-6	2.1	920	920	530	26,020	27,830	1.1:1	
437-8	3.3	1,450	1,450	500	24,550	43,870	1.8:1	
438-1	2.6	560	1,150	440	21,600	16,790	0.8:1	
438-3	0.6	240	270	173	8,490	7,260	0.9:1	
438-5	2.7	390	1,200	310	15,220	11,800	0.8:1	
438-6	0.8	350	350	278	13,650	10,590	0.8:1	
439-1	3.1	820	1,200	457	22,440	24,960	1.1:1	
439-3	9.5	1,120	2,000	660	32,400	34,030	1.0:1	
439-4	0.5	220	220	162	7,950	6,660	0.8:1	
439-6	1.3	570	570	384	18,850	17,240	0.9:1	
439-7	2.8	1,250	1,250	415	20,380	37,820	1.9:1	
440-5	1.5	660	660	266	15,560	19,970	1.3:1	Pumping Plant
440-9	5.3	390	2,300	288	14,140	11,800	0.8:1	
441-3	5.5	1,240	2,400	360	26,680	37,660	1.4:1	
442-3	10.1	580	4,400	300	14,730	17,700	1.2:1	
444-8	2.7	1,100	1,200	388	19,050	33,130	1.7:1	
446-1	6.0	600	2,800	445	21,850	18,150	0.8:1	
446-4	6.9	500	3,200	290	14,240	14,980	1.0:1	
446-5	1.3	460	460	146	7,190	14,070	2.0:1	
446-6	2.5	700	1,170	385	18,900	21,330	1.1:1	
447-6	7.3	1,100	1,750	456	22,390	33,130	1.5:1	
447-10	7.8	400	1,000	292	14,340	12,250	0.9:1	
447-12	1.0	340	340	251	12,320	10,280	0.8:1	
449-18	0.9	470	470	226	11,100	14,370	1.3:1	
451-7	1.8	960	1,000	490	27,640	29,040	1.0:1	Pumping Plant
452-5	4.4	860	860	429	21,060	26,020	1.2:1	
453-5	1.3	460	480	247	12,120	14,070	1.2:1	
454-4	1.2	600	600	278	15,630	18,150	1.2:1	Pumping Plant
454-6	1.0	450	450	261	12,810	13,550	1.1:1	
455-1	2.5	380	850	234	11,590	11,340	1.0:1	
458-2	3.5	1,060	2,750	670	32,900	32,220	1.0:1	
459-2	1.0	580	580	265	13,010	17,700	1.4:1	

Continued

TABLE C.15 - DATA AND COSTS FOR FEASIBLE IRRIGATION WATER STORAGE SITES, OSWEGO RIVER BASIN NEW YORK

Site No.	Drainage Area (Sq.Mi.)	Acre Feet Supplied	Total Beneficial Storage	Install. Cost ($1,000)	Average Annual Cost	Average Annual Benefits	Benefit: Cost Ratio	Remarks
460-5	7.5	720	4,400	407	22,160	21,780	1.0:1	
461-4	1.8	330	1,160	260	12,770	9,980	0.8:1	
462-1	1.6	360	940	222	10,900	10,890	1.0:1	
462-2	4.1	630	2,410	515	25,280	19,060	0.8:1	
TOTALS		38,380	89,980	21,097	1,067,770	1,161,650		

1/ Some of the irrigable lands are higher than the reservoir, therefore, a pumping plant is needed to lift the water to these lands.

TABLE C.16 - DATA AND COSTS FOR IRRIGATION WATER DIVERSION PROJECTS, OSWEGO RIVER BASIN NEW YORK

Watershed No.	Source of Water 1/	Total Acres	Acres to be Irrigated	Install. Cost ($1,000)	Ave. Annual Costs	Ave. Annual Benefits	Benefit: Cost Ratio	Remarks
454	Barge Canal	6,800	3,400	1,306	95,900	102,860	1.1:1	Sodus Ditch
435	Barge Canal	1,080	540	137	14,420	16,340	1.1:1	By Port Gibson
454	Seneca River	2,000	1,000	173	19,780	30,250	1.5:1	Crusoe Creek
127	Barge Canal	610	610	25	3,970	18,660	4.7:1	Rome Muck
127	Barge Canal	2,080	1,040	163	19,140	31,460	1.6:1	Verona Mills
TOTALS		17,970	9,290	2,800	207,210	281,270		

1/ The Barge Canal has a greater potential than this; detailed study in 7 areas only.

RECOMMENDATIONS

The following projects are recommended for action under the PL-566 program in the Oswego River Basin:

Canandaigua Outlet

This project would supply irrigation water to 7,440 acres from three (3) reservoir sites. Total cost of the project is $2,145,000. Water for augmentation to the Canandaigua Lake Outlet would also be available.

Clyde River

The two (2) reservoir sites in this project would supply irrigation water to 2,600 acres and also supply water to augment the Barge Canal. The total project cost is estimated to be $1,145,000.

Flint Creek

The watershed is being planned under an active application under the PL-566 program. One of the two reservoirs proposed will contain irrigation water for 3,900 acres. The estimated cost is $279,000.

Kashong and Wilson Creeks

This project would supply irrigation water to 4,680 acres from two (2) reservoirs and also include a recreation development. The estimated project cost is $1,809,000.

Rocky Run

The three (3) reservoirs proposed in this project will supply irrigation water to 6,400 acres along with water for augmentation to the Canandaigua Lake Outlet. The estimated project cost is $1,663,000.

Rome Muck

Included in the flood and drainage project is a proposal to irrigate 620 acres with a pumping system taking water from the Barge Canal. Total estimated cost is $602,200.

Six Mile Creek

The multipurpose reservoir in this project will supply irrigation water for 900 acres along with flood control and recreation. Total estimated cost is $1,431,000.

Sodus Ditch

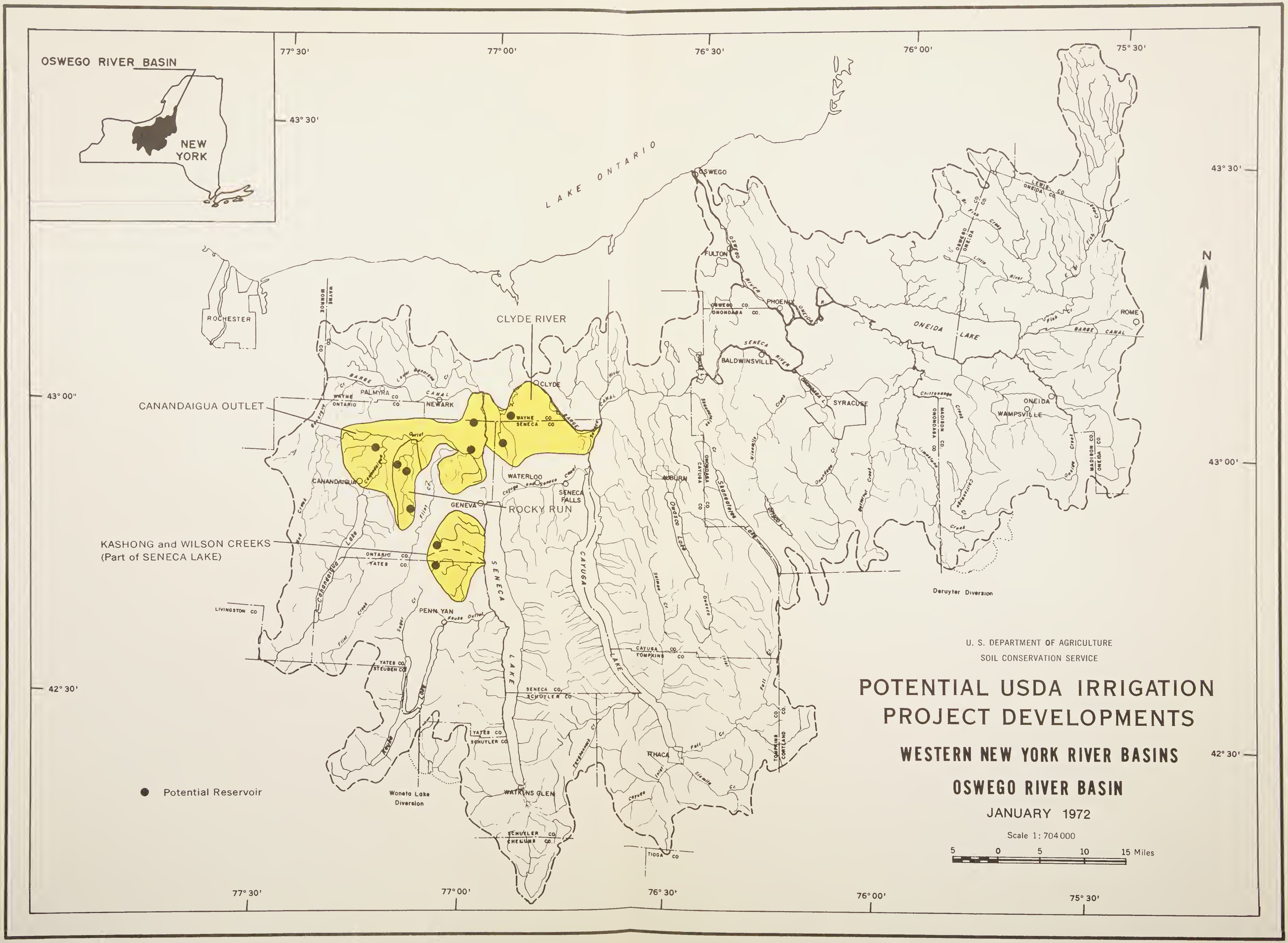
A proposal to irrigate 4,000 acres with water from the Barge Canal is included in this project along with flood control and drainage. The estimated cost is $1,107,000. Copies of the reports on these projects are attached, or included in Appendix B.

REFERENCES

1. *Irrigation Water Requirements,* Technical Release No. 21, United States Department of Agriculture, Soil Conservation Service, Washington, D. C., April 1964.

2. Mordoff, R. A., *The Climate of New York,* Cornell Extension Bulletin 764, New York State College of Agriculture, Cornell University, Ithaca, New York.

3. *Conservation Irrigation Guide for New York,* prepared by New York State Extension Service, New York State Experiment Station, Soil Conservation Service, and Agricultural Research Services, March 1956.



USDA-SCS-HYATTSVILLE, MD. 1973

FIGURE C.7

SPECIAL PROJECT STUDIES

UNDER

USDA PROGRAMS

Appendix D

HECTOR LAND USE AREA, NEW YORK

United States Department of Agriculture Report

Western New York River Basins

Oswego River Basin

Prepared by

United States Department of Agriculture

Soil Conservation Service   Economic Research Service   Forest Service

March 1971

HECTOR LAND USE AREA

LOCATION, SIZE AND COVER TYPES

The Hector Land Use Area is located in the approximate center of the Finger Lakes Region of New York State. It is situated in Schuyler and Seneca Counties on a plateau between Cayuga and Seneca Lakes, the two largest Finger Lakes.

Federal ownership is 13,259 acres with about an equal amount of private land intermingled. The Hector LUA is the only area administered by the U.S. Forest Service in New York State with the minor exception of a 520 acre organization camp.

The cover types are as follows:

TABLE D.1

	Acres
Improved Pastures	5,014
Timber Stands	4,332
Transition (includes open fields, brush and areas with scattered trees)	3,913
TOTAL FEDERAL OWNERSHIP	13,259

HISTORY

The area came into existence in the 1930's as a submarginal land adjustment project purchased primarily under the Bankhead-Jones Farm Tenant Act. Lands at that time were in farms and many areas were seriously eroded. The first effort by the Resettlement Administration was to relocate farmers from the purchased lands to better areas of better soils so that these farmers could make a new start.

In 1938 the area was placed under the U.S. Soil Conservation Service and developed as a project for public grazing and other land use development. The other development consisted primarily of reforestation of certain fields with conifers. Under the Soil Conservation Service, about 5,000 acres of former cropland was developed and fenced into permanent pastures, and grazing was established under a permit system to local livestock owners.

In 1946 the Hector Cooperative Grazing Association was formed as a nonprofit association under New York law. The federal government continued to invest in the development of the pastures over the next eight years.

In 1954 the area and many others throughout the country were transferred to the U.S. Forest Service for administration. In 1957 the area came under the administration of the Green Mountain National Forest with headquarters in Rutland, Vermont. At that time the federal government was still investing funds in the development of pastures and associated improvements. In 1961 a professional forester was assigned as Forester-in-Charge with headquarters in Ithaca, New York. At that time a complete analysis of the administrative situation was made, which resulted as follows:

1. Except in exceptional cases, maintenance and development of pastures and improvements would be done by the Hector Cooperative Grazing Association and federal funds would be used for development of the other resources.

2. A Multiple Use Plan and functional resource plans would be developed for the area, together with supporting plans such as fire control, I&E, etc.

3. Administration of the area would be brought in line with procedures and development followed on National Forests. Since that time, planning and development has considered all resources as will be shown in following sections of this report.

ACCOMPLISHMENTS UNDER PREVIOUS FEDERAL AGENCIES

Although there were several federal agencies such as the Resettlement Administration, the Bureau of Agricultural Economics, etc., involved in the first few years, these were mainly for the purpose of acquiring land and resettling the previous owners. The first agency to do actual development was the Soil Conservation Service. The SCS plowed, reseeded, limed, fertilized, built fences, and livestock ponds, and in general developed about 5,000 acres of permanent pastures. In addition, some 1,100 acres of various species of pine and spruce were planted in the early 1940's. Also, there was some effort made on multiflora rose hedges in certain locations which were to serve as fences for cattle and have wildlife benefits. These were the main activities. The following sections will indicate development by the U.S. Forest Service which actually began an active program in 1961.

SITUATION ANALYSIS AND NEEDS

This section covers accomplishments of the Forest Service and presents existing status and future needs for each resource and activity.

A. Grazing -

1. Current Status

Some 5,000 acres are now in 39 fenced pastures. Two thousand head of cattle graze each summer. These are owned by over 120 farmers who make up the Hector Cooperative Grazing Association which is the only such organization operating on public land in the northeastern United States. Cattle come from a 12 county region generally to the north and west of the Hector Area. The Forest Service works with the Grazing Association by giving technical assistance such as soil analyses and developing work plans with the Grazing Association operation. However, the Grazing Association is now a business-like basis whereby its income of about $40,000 annually is used for the care of livestock and the liming, fertilizing, clipping, and other maintenance needs of pastures in addition to new fence replacement and fence and pond maintenance. The Grazing Association is a nonprofit organization, which means that its income must be used in the operation of the grazing program on the Hector Land Use Area.

Some interesting statistics are that there are about 80 miles of barbed wire fences and 38 livestock ponds which occur on the 36 individual pastures. The annual carrying capacity of 2.5 acres per cow is very high for the National Forest System, and locally farmers consider grazing to be very good on the Hector Land Use Area. Weight gains are estimated at about 300,000 pounds per year valued at about $75,000 to the Association members.

2. Future Plans

Operation under the Hector Cooperative Grazing Association will be continued. No new pastures will be developed. Emphasis will be placed on higher standard of vegetation and improvements of existing pastures. Cattle demands are not expected to substantially increase. More technical information on forage and its management will be collected by the Forest Service toward improvement of cattle management to more fully utilize forage.

B. Timber -

1. Stand Size Classes

Following is a breakdown of stand size classes. The timber stands include about 1,100 acres of plantations approaching 30 years of age and some 3,200 acres of woodlots with maximum size of about 250 acres.

TABLE D.2

		Acres
Class I	(Ave. DBH 12" and over, 80-120 yrs.)	692
Class II	(Ave. DBH 8"-12", 50-80 yrs.)	2,051
Class III	(Ave. DBH under 8", under 50 yrs.)	1,589
	TOTAL TIMBER STANDS	4,332

2. Timber Quality

Because of poor soils drainage, most sites and species quality are fair to poor. Height growth is limited to 1-1/2 logs in most cases. Diameter growth is slow on most sites. Red oak and hickory appear to be the best hardwoods on the area. The plantations were not thinned early enough for the species, such as red pine which can be managed for timber. Of the 1,100 acres, there is only about 500 acres of red pine and Japanese larch which can be managed for timber. The remaining acreage is a combination of species such as jack pine and pitch pine, which have very poor form and are extremely limby. Most hardwood stands contain very few trees over 14 inches DBH, and basal areas of desirable species is at a minimum.

3. Timber Demands

There are strong sawlog markets in the area, but no markets for other products. Since the stands contain a minor amount of sawlog material ready for cutting, timber sales have been infrequent and confined to small pockets which were missed in earlier days. The history of stands is that many former owners reserve the timber rights and cut all the merchantable timber years ago.

In addition, after the area was in Federal ownership, stands were cut over to low diameter limits without much effort toward improvement or silvicultural needs. It will take many years for these stands to have any substantial sawlog volume to be harvested. One important item is that there were some 70 acres of black locust planted in the 1940's. These plantations have produced some 35,000 posts for pasture fence construction and maintenance. Each year there are some 2,000 posts cut from these plantations under administrative use for fence maintenance. Because of the limited acreage and sizes large enough for posts, these black locust plantations are managed strictly for administrative use since there is no excess available for sale.

4. Timber Stand Improvement

a. Accomplished

Timber stand improvement by the Forest Service since 1961 has been confined to the better sites in both hardwoods and in plantations, in pole stands for thinning. Plantations have also been pruned. About 600 acres of hardwoods and plantations have been thinned in the past seven years. Timber stand improvement has been limited to this acreage since there are so few good sites in which to work where investment is justified.

b. Planned

A complete inventory of all timber stands was made in 1966 which showed that only 15 percent of the total stand area or about 600 acres had good timber stand improvement potential. Therefore, the program at this time is aimed at thinning in these stands. Recent budgets have been enough to thin about 60 acres per year. With the outlook for continued budget restrictions, thinning will continue at this rate.

C. Wildlife

1. Habitat and Populations

The intermingled woodlots, pastures, open fields and plantations combined with areas in brush cover of desirable wildlife plant species provide an excellent basic wildlife

habitat. The deer and grouse populations are very good. The current deer population is estimated at about 600 or about one deer per 22 acres. The legal deer kill estimated in 1969 was 200, which is a high deer kill per acre for the National Forest System. Other game species such as squirrels and rabbits are very abundant.

There is also a wide variety of non-game species, such as song birds, etc., which are of great importance to the public use of the area.

2. Hunting, Wildlife Observation and Fishing

The recreation section of this report will cover statistics on numbers of visitors. However, it is important to note some specific items. Each year the Forest Service makes a deer hunter survey. It has revealed that about 1,000 hunters are on the area on the first day of deer season, which makes a very high hunter density. The surveys further show that hunters come from many counties in New York State up to 100 miles away. A number of hunters camp for several nights on the Hector Area during deer season.

There is substantial use by small game hunters for grouse, rabbits, squirrels, and pheasants. Of growing importance is wildlife observation. More and more families come to the Area to observe both game and non-game species in their natural surroundings. The Area is excellent for this use because of its easy access and variety of species. Out of the many wildlife ponds and livestock ponds, there are about seven ponds of one to two acres in size where warm-water fishing is very popular. Most other ponds are not suitable for fish management because of shallowness or location.

3. Habitat Improvements

a. Accomplished

Since 1961 the Forest Service has carried on specific habitat improvements such as clear-cut areas, maintenance of old fields in low cover, hunter access lanes, and improvements such as the development of a trail system of 20 miles. There are now 32 wildlife units ranging from 1/4 acre to 80 acres. The total of these is 341 acres. They have been developed since 1961 and are on a continual maintenance basis to keep them in varying stages of succession for food and cover requirements.

Under a cooperative agreement with the New York State Department of Environmental Conservation, they have constructed 24 shallow water impoundments which range in size from 1/4 acres to 15 acres. Also under this cooperative agreement, the Department of Environmental Conservation has released 100 snowshoe rabbits for the purpose of establishing a population of this species on the Area. The entire Area is signed with some 300 Public Hunting Ground signs to indicate that it is open for public hunting, since most adjacent lands are posted to prohibit hunting.

The U.S. Forest Service cooperates with the U.S. Fish and Wildlife Service in the stocking of certain ponds each year.

b. Planned

The plans by the Forest Service are to maintain the existing units including both vegetative areas and ponds on an annual basis. With over 300 acres needing periodic treatment, and 24 impoundments requiring annual mowing, exclosure fencing, etc., the maintenance job is large in itself. The 32 vegetative units coupled with open fields and pastures have adequately developed the habitat since the total Hector Area is of limited size. The vital need now is to maintain this habitat in the proper stages of cover from year to year so that the present high populations of species can be sustained.

Wildlife management is at the point where it is probably not desirable to increase populations higher than at present. Emphasis therefore will be placed on making these populations available to both hunters and those who wish to observe wildlife and photograph birds and animals. Therefore, development as such will include the improvement of the trail system and road system for improved access. Some additional development of wildlife impoundments is planned. Several small impoundments similar to existing ponds will be developed for fishing. Also, an additional 100 acres of new game openings are planned.

D. Recreation

1. Role in Finger Lakes Region

Since the Hector Land Use Area is located in the center of the Finger Lakes Region, it is in a strategic location in relation to the large urban centers of upstate New York such as Syracuse, Binghamton, Elmira, and Rochester. There are over 30 million people living within 200 miles, which is over 1/7 of the population of the United States.

The Finger Lakes Region is one of the major recreation regions of New York and is under heavy recreation pressure. Within this region, the Hector Land Use Area is one of the largest public land units. The role of the Hector Land Use Area can only be understood when the situation on other lands is known. New York State has an excellent State Park system. Several State parks are located to the east and west of the Hector Area, however, these are developed for high density use on small acreages. There are areas of State reforestation lands, but these are largely undeveloped to date.

Private developments, such as campgrounds are springing up in the region, but these are limited to small areas for intensive use. With these facts in mind, an area is needed which is managed as a natural environment area with a minimum of restrictions, but with basic facilities for the visitor to enjoy the resources and allow him to seek out what he enjoys most in the out-of-doors. It is an established fact in this region that a large number of people, particularly families and organized groups such as Scouts, trail clubs, etc., strongly seek such an area. This is the need the Hector Area is filling and must continue to fill in the future so that it will complement rather than compete with developments on other lands. The popular activities are camping, picnicking, hiking, nature study, hunting, and snowmobiling, which has shown a tremendous boom in the last two years.

2. Present and Predicted Use

TABLE D.3

Recreation Use

	Visitor Days 1960	Visitor Days 1970
Snowmobiling	0	3,300
Camping	100	11,400
Picnicking	400	2,500
Hiking		2,000
Horseback Riding		1,000
Nature Study	0	2,000
Hunting	800	9,900
Fishing	100	2,000
Other	100	4,300
TOTAL	1,600	38,400

One visitor day = 12 visitor hours

The increase in recreation use has been dramatic. In 1970 it was more than 24 times that of 1960. When it is realized that there has been only limited development in campgrounds and picnic grounds, it seems clear that the area is being well utilized by visitors. It is very clear that any developed site will be fully utilized. In support of this, a report on *Outdoor Recreation Demand, Supply and Needs in Appalachia* by the Bureau of Outdoor Recreation in 1967 shows the demand in the subregion of 10 counties in New York and 3 in Pennsylvania. The present demand is over 15 million visitor days. By 1980 the demand is estimated at 26 million visitor days.

Based on a straight line projection of use increasing on the Hector Area at the present rate, the use by 1980 would be 80,000 visitor days. However, if additional development is made as planned, the predicted use would be many times this figure. It is obvious that predicted use by the year 2000 and 2020 is very difficult to estimate since this

is entirely dependent on whether the area can be enlarged and full recreation development program funded.

This much can be said - that if the transportation system for major highways surrounding the area, such as the Southern Tier Expressway and other major highways are developed, there will be no question that the public use demands for Hector and the whole Finger Lakes Region will be much greater than the combined federal, state, local and private recreation planning is now geared to handle. For example, surveys show that there are over 3 million cars traveling the New York Thruway in a seven-day period and that 3/4 of these involve people who are seeking recreation. Similar use can be expected on other major transportation routes in the region. Therefore, even if part of these people used the Finger Lakes Region, it is obvious what the demands will be.

3. Existing Development

There are presently two developed sites. The Blueberry Patch Recreation Site has 12 family units with a capacity of 60 people. The Interloken Trail Shelter Site has a capacity of 10 people. There are 20 miles of hiking, snowmobile, and horseback trails. From this, it is obvious that most activity takes place in undeveloped areas such as around the 24 wildlife impoundments and at undeveloped locations at the edge of fields and woodlots along the roads. Hunters and snowmobile enthusiasts use the entire area including the pastures since cattle are gone by mid-October.

4. Planned Development

TABLE D.4

SUMMARY OF RECREATION DEVELOPMENT NEEDS

Type of Site	No. of Sites	People at One Time Capacity	Cost
Camp	2	150	$ 68,000
Ground Camping	1	100	15,000
Picnic	7	150	40,000
SUBTOTALS	10	400	123,000
Self-guided Interpretive Trails (2 ea.)			3,000
Visitor Information Station			15,000
Trails (7 miles)			7,000
Impoundments (Fishing - 5 ea.)			25,000
Access Roads & Parking Areas (For Development Sites)			24,000
PRESENT FEDERAL OWNERSHIP TOTAL			$197,000

5. Conservation Education

Because the area is a good demonstration of multiple land use and since it is surrounded by many schools and a large population, field trips and Conservation Field Days are more and more a part of the Forest Service program each year. For example, over 350 sixth graders attend a Conservation Field Day each fall, and there are many elementary school classes and Scout troops which attend conducted field trips. There is also interest by certain conservation classes at Cornell University to take land use field trips. This type of use has great potential and the prediction is that it will greatly expand in the future.

E. Soil and Water

1. Soils

The so-called *problem soils* of New York are prevalent on the area. They are soils on glacial till and are acid with a hardpan at 12" to 18". Soil drainage is imperfect to poor on these silt-loam soils. The soils are uniformly deficient in phosphorus. These soils limits hamper plant growth, including trees. However, they are excellent for impoundment construction.

2. Importance to Surrounding Areas

Water from the Hector Area drains east to Cayuga Lake and west to Seneca Lake into an area of about 10,000 population. However, Hector makes up only about 20 percent of the watershed. The other 80 percent is predominantly agricultural land, much of which is tilled and has accelerated runoff with associated erosion and stream and lake silting. The Hector watershed is very limited in its total influence on the surrounding region since it is only two or three miles wide. It does play a role in ground water supplies for the people living adjacent to federal lands, since nearly all of these residents get their water from wells.

The Hector Area yields an estimated five billion gallons of water annually which alone could satisfy the domestic volume demands of the surrounding population if timing of runoff could be regulated. The quality of water leaving Hector is good because of proper land use. However, this water quickly joins poorer quality water on lands below. For these reasons, the Hector Area can play its small part in the quantity and quality of water supplied to downstream lands, but the Area is simply not large enough to have a profound effect on the region surrounding it between Cayuga and Seneca Lakes.

3. Existing Surface Water

Nearly all streams are intermittent since the Area is at the summit of the watershed. The only surface water appearing on the Area is made up of 24 wildlife ponds and 38 livestock ponds, all of which are man-made. These total about 51 surface acres. This acreage is adequate for livestock and wildlife needs for the present. An additional five small impoundments for wildlife purposes are needed, particularly for fishing. These will average about two acres each.

4. Watershed Management

a. Accomplishment

The section on the history of the Area pointed out that a large proportion of the lands were in crops prior to government acquisition. Many areas were continually eroding. Under the Soil Conservation Service, the establishment of permanent pastures on these eroding lands definitely corrected most of the erosion difficulties. Continual maintenance of permanent cover on these lands assures erosion control. To date there have been only small watershed restoration projects done by the Forest Service. In a ten chain section of Potomac Creek, channel clearing and a gabion check dam have been accomplished in 1968. A half mile section of the Potomac Road banks were reseeded by the Forest Service in 1967 to correct bank erosion and improve the appearance of the road.

Most watershed activity is in combination with other land use activities, such as pasture management and wildlife management. Keeping the total areas in proportions of woodland, low shrubs, and grass helps to balance water yields. Since forested areas tend to use up tremendous quantities of water in evapotranspiration, keeping areas in grass and low shrubs tends to produce higher water yields.

b. Planned

Erosion is now confined mainly to stream channels. The situation is that the shallow soils reach the saturation point very quickly during prolonged heavy rains or in spring runoff, so that water reaches the stream channels quite rapidly, giving a high rate of flow for a short period and then sharply declining so that there is practically no base flow. This causes streambank and channel erosion two or three times per year.

To correct this in all streams would require very intensive stream restoration work, such as riprapping banks, constructing numerous check dams, etc. The cost for such intensive work is prohibitive except in critical areas. In addition, there are a few locations adjacent to livestock ponds, for example, where corrective work is needed for spillways and minor gullying.

5. Municipal Watersheds

The Hector Area is not involved in any municipal watersheds as such. It does have some bearing on community water supplies in an indirect way, since surrounding settlements get their water from ground water supplies through wells, and communities such as Trumansburg are now developing water systems straight from Cayuga Lake where part of the water from Hector eventually drains.

6. Projected Water Requirements

Because of the location of the Hector Area in the center of a recreation region of heavy public use, demands for water for recreation are very high. However, there are no potentially large impoundment sites on existing federal land to add to the development of the Area. This points out the need for additional acquisition of lands where potential sites exist.

F. Fire

Fire protection for the Area is accomplished through the Forest Service itself and through cooperative fire agreements with the six volunteer fire companies which surround the Area. The Forest Service is also included in the radio communications system of the Schuyler County Fire Service.

There is annually about one fire on federal lands. Over the past ten years, nearly every fire has been man-caused. This ranges from burning fields on adjacent lands to hunters leaving campfires unattended. With increasing public use, there has been great need and greater attention given to fire prevention. As a standard practice, campfire permits are required except at developed sites. In addition, the fire mobilization plan calls for various actions including a ground patrol during serious fire weather. A fire danger station is operated on the Area, which is a part of the National Danger System carried on on all National Forests.

G. Insects and Diseases

A major concern has been larch sawfly which was seriously defoliating about 90 acres of larch plantations. A control project was completed in 1970. The Forest Pest Control section of the Forest Service from Amherst, Massachusetts, assisted in this project.

LAND ADJUSTMENTS

The federal ownership is so scattered in many areas that effective development and proper management is restricted. Therefore, in order to provide the best recreation opportunities and an efficient multiple use program, it would be desirable to acquire parcels of adjacent and intermingled private lands. For these reasons, a purchase boundary has been proposed which surrounds the present ownership. Within this, there is an estimated 13,000 acres of private lands. However, it is unlikely that more than half or 6,500 acres would be purchased eventually. Acquisition would be parcel by parcel according to priority needs such as impoundment sites and recreation projects. The availability of parcels for sale, of course, would have a great bearing on the location and acreage of land purchased from year to year. The cost of acquiring 6,500 acres over a 10-year period is estimated at about $1,300,000, or $130,000 per year.

It appears obvious that adjacent private lands will be more and more difficult to purchase and that prices are constantly rising. The Forest Service is unable to purchase land under the Weeks Law until enabling legislation is passed by the New York State legislature.